Track and Field Coaching Manual

Life Ready Through Sport

LA84 Foundation™

The LA84 Foundation is the organization created to manage Southern California's share of the surplus from the 1984 Olympic Games. Located in the historic Britt House since 1985, the LA84 Foundation has committed more than $160 million to create, support and expand existing youth sports programs, and develop the Paul Ziffren Sports Resource Center. The Sports Resource Center is a state-of-the-art learning and cultural center for sports which contains sports books, films, videos, photographs and memorabilia. To date, more than two million boys and girls and more than 1,000 youth sports organizations throughout Southern California have benefited from our endowment.

The goal of the LA84 Foundation is to be an innovator in youth sports and coaching, and to increase opportunities for achieving athletic excellence at every level. The Foundation grants financial assistance to organizations providing youth sports opportunities, initiates and operates its own youth sports programs including Run For Fun, Summer Swim, and offers free coaching education workshops through the LA84 Foundation Coaching Program. For additional information regarding the LA84 Foundation please visit our web site at **www.LA84Foundation.org**.

LA84 FOUNDATION TRACK AND FIELD COACHING MANUAL

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ISBN 0-944831-32-X
CIP 94-80269

Printed in the USA

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CHAPTER 1

A Philosophy for Coaching High School Athletes

High school coaching may be the most special and important profession anyone can choose. This is not because sports are important, but, rather, because the young men and women who participate in high school sports are so valuable. Coaches have an opportunity to foster both their athletes' emotional and physical development. The path to coaching success begins with defining a philosophy to guide your efforts.

The High School Coach, Someone Special

ATHLETES MEET SPORTS THROUGH THE COACH

It is the *coach* who frames the sport experience for the athlete. A study of 10,000 high school athletes concluded the quality of coaching has the greatest influence on whether or not participation in high school sports becomes a positive experience for the young athlete.

The collage of track and field events offers opportunities for athletic success to a wider variety of personalities, body types and natural athletic talent than any other sport. Combined with its dual offering of individual and team competition, no other sport can provide so much for so many. There are opportunities to develop physically, emotionally and socially. There are opportunities to discover hidden talents, learn about oneself and develop a new sense of competence and self-worth. There are opportunities to be part of a team while competing as an individual. There are lessons about life and reality. There is the motivation to pursue goals and objectives that most teenagers dismiss as being impossible. All these possibilities are woven into the unique fabric of sport. The responsibility of making them an intimate part of every young athlete's Track and field experience rests squarely on the shoulders of the coach.

THE ROLE OF THE COACH

What exactly is the high school coach's role: recruiter, teacher, trainer, strategist, personnel manager, administrator, promoter, communications expert, diplomat, spokesperson, psychologist, impartial judge, disciplinarian, caring friend, counselor, parent substitute? To be a high school coach is to assume all of these diverse roles. For the coach, the greatest reward should not be the outcome of winning, but rather the process of training and competition that positively affects the personal development of young athletes. Great coaches use sport as a vehicle to enrich the lives and the futures of their athletes.

IT DOES MATTER WHETHER YOU WIN OR LOSE!

While society often perceives winning as the most prized outcome of sport, *a single focus on winning by the coach can subordinate every other worthy outcome of an athlete's participation in sports.* There is nothing wrong with wanting to win; however, there is a difference between being focused and being obsessed with winning. It is important for a coach to evaluate him or herself often during the year to determine if winning has become the priority over doing what is best for the young people in the program.

At best, only 50 percent of the participants can be winners in any sport competition. In a sport such as track and field, only one team among several and only one individual among many achieve victory.

So, does everyone else then become losers? Is there no opportunity for achievement, fulfillment and fun without winning? Is winning really the ultimate goal of sport or is there a more important objective and a more attainable goal?

WINNING VS. SUCCESS

The opportunity for success is available to everyone if it is defined as performing to one's capability rather than focusing solely on the score of a given competition.

This is especially true in the sport of track and field where individual improvement can be quantifiably measured by a watch or measuring tape. Even though a team may lose on the scoreboard, the shot putter who places fourth in his event but improves his lifetime best mark by a foot or the hurdler who does not place in the race but "three steps" all flights for the first time certainly has reason to feel successful.

Teaching athletes to focus on success and discussing with them what success really is, rather than allowing winning to be the only measure, nurtures the factors that ultimately lead to winning.

Success = Ability + Preparation + Effort + Will

Ability. Everyone has ability, but it isn't distributed equally or predictably. This applies to coaches as well as athletes.

Often ability is a gift of birth, but that doesn't guarantee success. The challenge isn't to have ability but to develop and use the ability that is given.

Preparation. We gain greater use of our abilities by investing in preparation. Only through the persistent and consistent process of preparation can raw talent be transformed into greater capability. In track and field, this preparation is called training. Through proper training, athletes become faster, stronger, more skilled, knowledgeable, confident and mentally tough; however, although developing greater capability is important, it is still no guarantee of success.

Effort. Developed ability realizes its value when expressed through the challenge of competition. That expression is accomplished when physical and mental effort summon every ounce of one's capability. Still, athletes often find themselves nearing the finish of their race exhausted, having given all they think possible, but needing to find even more. In sport this is called...crunch time!

Will. Crunch time is real, both in sport and life. It is that moment when a person thinks he or she has given all there is to give, only to find out even more is required. Many athletic contests are won or lost at this moment. Some athletes are able to draw on an inner strength to summon greater effort than they know themselves to have. This is the use of one's will, the power to go back to one's personal reservoir again and again as needed.

When athletes and teams train hard to develop their ability, give their best effort in competition, and show the will to push themselves beyond self-imposed limits, they are successful.

Too often, coaches and athletes miss experiencing the pride and satisfaction of success because they are too focused on winning. More often, coaches and athletes fail to win because they first fail to become successes.

BUILDING SUCCESS

Unlike winning, success can be experienced by every athlete every day. It doesn't, however, come easily or immediately. Success requires athletes be coached to develop some specific, personal attitudes. Robert Goodwin, track and field coach at St. Lawrence University, has identified six such attitueds.

1. The desire to strive for excellence.

2. The realization that nothing of value can be achieved without hard work and dedication.

3. The desire to display self-confidence.

4. The desire to show one's ability in competition.

5. The desire to cooperate as part of a team.

6. The desire to have fun.

THE DESIRE TO HAVE FUN

The desire to have fun deserves special attention. Sports should be fun for both athletes and coaches. *The opportunity to have fun is consistently identified by students as the number one incentive to participate in high school sports.*

Athletes must understand the "fun" referred to here is not the “fool around” fun we see in our locker rooms, on the bus, or at team parties. It is the pride, satisfaction and fulfillment a youngster experiences from improving his or her strength, speed and skill after hours of training and practice. It is the thrill and exhilaration of setting a new personal best in competition. This is the fun that all athletes and coaches seek. It is the fun of feeling good about oneself – the feeling that stays with athletes long after they have left the track.

When athletes experience this kind of fun, they become consumed with the desire to feel more of it more often...preferably as soon as possible. Developing this desire to have fun may be the most important attitude coaches can teach. When athletes are filled with the desire to have fun, they are likely to:

- Strive with all their heart for excellence.
- Dedicate themselves to consistent hard training.
- Show the self-confidence to make the tough decisions and sacrifices it takes to train and compete at their best.
- Be anxious to show their ability in competition, free of fear or self-doubt.
- Gain personal strength from respecting, helping and caring about their teammates.

So, What About Winning?

Where, then, should winning fit into a coaching philosophy? As noted earlier, nearly every coach would prefer to win every contest. Realistically, however, it is important for coaches to admit that it does not matter much whether or not our athletes win all those races. What does matter is that coaches win the battle to enhance the lives of their athletes through the experience of participating in track and field. For coaches, this is the most important win of all. This is the true measure of coaching success.

SHAPING THE ENVIRONMENT

Most people believe sport teaches participants high ideals and admirable personal qualities such as pride, courage, confidence and respect. Unfortunately, this is not always true. None of these ideals and attributes are inherent in sport. It is the coach who frames the experience of participating in sports within the environment he or she creates for the program. For every athlete who has experienced pride through sport, others have experienced relentless criticism and ridicule from their coaches. For every athlete who has gained courage from competition, others have been gripped by the fear of intense scrutiny and high expectations by their coaches. All too often, athletes develop attitudes of disrespect, hate and vengeance for their opponents, officials, teammates and coaches.

Sport is fertile ground for learning. Coaches, both good and bad, are effective teachers. Lessons learned are learned well. Consciously or unconsciously, the coach designs and controls his or her sport environment. Every coach is encouraged to invest significant time and effort into engineering an environment that nurtures pride, confidence, courage, respect, responsibility, trust, caring, leadership and other attributes the coach believes to be important. These must be reflected and constantly reinforced in the attitude, words, actions and behavior of the coach.

A GREAT COACH MUST BE A GREAT COMMUNICATOR

Without question, the key to being a successful coach is the ability to communicate effectively. Communication is a two-way process between the sender and receiver. It takes on many forms, some overt and others subtle. Coaches communicate with their athletes by what they *say*, how they say it, what they *write*, what they *do* and how they *behave*. To communicate effectively, coaches must also receive communication from their athletes. In a word, coaches must *listen*.

Guidelines to Improve Communication Skills

- **Understand the primary burden of responsibility for any communication belongs to the sender, not the receiver.**

  If it is important enough for a coach to say or write something to an athlete, it is important enough to be repeated, reinforced and reviewed to be sure the message is understood. Communication must be an ongoing process, especially with high school athletes.

- **Coaches must communicate with those *under* them with the same degree of respect as with those above them.**

  Some coaches are unaware they may be communicating with younger athletes or athletes they perceive to be of lesser quality in a condescending or demeaning fashion. A coach should always ask himself or herself if the choice of words, tone and style of delivery reflects the attitude and respect that coach would like to receive in communication from an athletic director or principal.

- Communicate with athletes regularly, consistently and thoroughly.

  Make communication easier by having at least one team meeting a week so athletes come to anticipate and expect certain messages. Avoid just *talking at* the athletes. Ask for their questions and input.

- Instruct Constructively.

  Too often, athletes are only told what they are doing wrong. It is more important, and far more effective, to tell them how to do things well by use of the following:

  - Reinforce the positive.
  - Praise what athletes are doing well – this prepares them to be receptive to the next instruction.
  - Explain the cause of the mistake and how to correct it. Be specific and keep it short. Athletes can only process a limited amount of information at one time. Be patient and careful not to show any frustration.
  - Use the "Sandwich" approach. "Sandwich" corrective instruction between two positive comments to take the sting out of continued corrections.

UNDERSTANDING MOTIVATION

True motivation must come from inside the individual to be effective and long term. Motivation cannot be given to someone; however, it can be nurtured and tapped. The word motivation is derived from the word motive, which is the desire to fulfill a need.

The primary need we all have is the need to feel worthy. Our sense of self-worth is enhanced most by feelings of competence, accomplishment and acceptance. Simply put, we feel better about ourselves when we feel we are doing something well. We will work hard to improve in areas where we believe we have the potential for success. The more effort we put into the process of improving, the more our feelings of increased competence enhance our feeling of self-worth. Accomplishments and recognition along the way reinforce our worthiness. We also measure our self-worth by the acceptance we get from others, especially the sense of belonging to a group of peers.

The need to feel worthy is the single most powerful element of motivation. It should be easy to see why sports are a perfect vehicle for boosting an individual's sense of self-esteem. However, since only a few can be champions, there is a danger of athletes equating self-worth with the ability to win in competition. The message is, while the coach cannot make every athlete feel gifted, he or she can make all team members feel more competent.

What a coach can guarantee is that every athlete feels important and accepted. No athlete should have to earn a coach's acceptance. They should all be unconditionally accepted, and they should know it is OK to make a mistake. Once athletes of any ability level feel the security of having a coach's time, energy, interest, belief and trust, it is literally amazing the great things they will dare to do.

ADVICE TO HELP A COACH SURVIVE AND PROSPER IN COACHING

Dr. Rick McQuire, head track and field coach, at the University of Missouri offers the following suggestions.

- Family comes first. Coaching is so time intensive the only way a coach can be assured of having time with his or her own family is to make time. Before a team's meet or training schedule is completed, the family schedule should be done first.
- Expect success. Visualize what you want to accomplish. Winners know what will happen...losers fear what might happen.
- Take the lead. Showcase the track and field program in your school and community. Fight for equitable funding. Take a cue from football and basketball and give track and field a chance to be a spectator sport by presenting your home meets as entertainment.
- Project yourself. Put your personal stamp on each of your athletes, assistant coaches and on every phase of your program.
- Surround yourself with good people. No one person can successfully coach a large group of athletes. To succeed in track and field, a head coach must recruit and train assistant coaches who will adopt the head coach's philosophy, share the commitment, and join the quest for success. An assistant coach, no matter how knowledgeable in a specific track or field event area, with a bad attitude can sabotage an entire program.
- Know who your friends are. Anyone in a leadership role is subject to the positive

or negative influence of others. Identify those who can positively influence your coaching career and seek their advice and council.

- Be true to your values. It can be easy to compromise in the quest to win. Say what you believe. Do what you say. Nothing is harder to earn and easier to lose than a good reputation.

High School Sports as an Extended Classroom

Schools have interscholastic sports programs because they provide students with unique learning experiences that are not obtainable in other segments of the school curriculum. Through participation in interscholastic sports, athletes improve strength, speed, endurance and acquire the complex skills and poise needed to perform at their best in athletic competition.

Few educators have the opportunity to affect the lives of their students more than a coach. The best coaches use their practices and competitions as *extended classrooms* and strive to inspire athletes to reach for their best both athletically and academically. High school students are young adults who look to their coaches for leadership, knowledge, instruction and direction. Many lessons can be taught and learned through participation in competitive interscholastic sports such as how to set goals, how to compete, how to take risks, how to deal with success and failure and how to maintain emotional self-control. Important values and attitudes such as sacrifice, dedication, accountability and self-confidence can be learned along with such virtues as good sportsmanship, teamwork, camaraderie, respect for opponents, mental toughness and persistence in the face of adversity. Those experiences and character traits will lead young athletes toward successful, fulfilling lives long after their high school athletic careers are over.

The benefits that can be derived from participating in sports, however, do not result from participation alone. *Research indicates it is the quality of adult leadership that determines whether youngsters have a good or bad experience in competitive sports.*

An effective high school coach will be an inspirational leader, a knowledgeable teacher and an appropriate role model. More than just a teacher of skills and strategies, the high school coach is a significant adult force in the life of a student-athlete. Coaches can have a great impact on the psychological growth and personal development of athletes.

Developing a Coaching Philosophy

DETERMINING COACHING OBJECTIVES

The two most important considerations in developing a personal coaching philosophy are determining coaching *objectives* and coaching *style*. Coaching objectives could include improving the program's win/loss record, winning a league title, placing among the top five teams in the section or state championships, showing significant individual and team improvement, making the program fun for all the athletes, or teaching the athletes to compete well.

High school coaches often believe their first responsibility is to produce winning teams; however, winning should not be the single measure of success for the coach or the athletes. An overemphasis on winning can produce such negative responses in young athletes as anxiety, fear of failure, reduced self-esteem and a loss of motivation.

Coaching success should be measured in a variety of ways other than a state ranking, win/loss record, or a high place in the league meet. The number of athletes attracted to the program, the athletes' enthusiasm for track and field, the improvement the team shows through the course of the season and the amount of parental/community/school interest and support generated for the program are equally important measures of success.

Winning the majority of the meets during the season does not necessarily make any coach a good leader or positive role model for young athletes. A coach's actions speak louder than words, especially during competition. Coaches must teach respect for the rules, the opponents and the judgment and integrity of officials by example through their behavior.

DEVELOPING AN EFFECTIVE COACHING STYLE

Coaching style reflects how a person chooses to lead and interact with student-athletes. It affects how a coach wants to motivate and discipline, and what role, if any, athletes are permitted to have in making decisions that affect them.

Each person must choose the coaching style that best fits that person's personality, but every coaching style is a somewhat different combination of three approaches: authoritarian, cooperative and passive coaching styles.

Everyone new to coaching should take some time to consider what coaching style works best for that person. Experienced coaches should also periodically re-examine their coaching styles to ensure they are still following the path onto which they originally embarked.

Here are some suggestions that can help determine a sound coaching philosophy:

- Remember the *athletes* should be the center of attention. Sports were not created to glorify coaches.
- The simple objective of coaching is to help athletes shorten the trial-and-error process of learning and ease the trial-and-terror experiences of competing.
- When coaching, focus on the skills needed, a method to teach and demonstrate them, and drills to practice and master them.
- Integrity, credibility and technical knowledge are the most important qualities of a good coach — in that order.
- Every athlete deserves to be addressed by first name and treated with dignity.
- A coaching style must not isolate a coach from the athletes. There must be a forum for open communication or the coach will never be in touch with the athletes. Coaches need to be willing to listen to all the athletes, hear criticism and respond by acting rather than reacting.
- Coaches cannot talk about winning without talking about losing. Is placing second or third, or not placing but recording a personal best, considered a failure? How do the athletes behave when they finish races they lose? How does the team behave after a tough loss? How are athletes expected to bounce back after performing poorly?
- Regardless of the style, coaches need to command their athletes' attention and respect. Coaches must continually and openly communicate, motivate, praise and discipline effectively.

TLC: TEACH • LEARN • COMPETE

Every decision a high school coach makes should be in the best interest of an athlete's physical, psychological and social development. The philosophy advocated by the LA84 Foundation is **TLC**: teaching, learning and competing.

Teaching represents what a coach provides student-athletes by way of instruction.

The lessons a coach must teach include technical skills, positive attitudes about competition, the process of training and effective tactics and strategies. A coach must also teach athletes emotional self-discipline, responsibility, self-esteem and how to maintain poise by focusing on the things they can control. No less important are social values such as appropriate behavior, fair play, good sportsmanship and the importance of working together to accomplish team goals and objectives.

Learning is the athletes' acceptance of what is taught. Learning is greatly influenced by the atmosphere a coach creates in helping athletes reach for their best. Effective learning requires communication, motivation, feedback, cooperation and purposeful training. A positive approach to practice and training that emphasizes skill development, fitness, teamwork and fun will help to ensure athletes' learning experiences are positive.

Competition is the essence of sport. Competitive skills are essential to prosper in a society where we compete for grades, spouses, jobs and promotions to achieve success, happiness and security. Track and field is a sporting arena in which athletes demonstrate both their physical and competitive skills. Coaches should portray the adventure of athletic competition as an opportunity for success rather than failure.

Coaches must help athletes learn as much as possible from their competitive experiences, analyze what they do well and what they don't do well, and resume training with a new agenda and a renewed determination to improve. Coaches should emphasize that success in sports should be measured by each athlete's personal performance goals. Just because every track and field event has only one winner doesn't mean everyone else in that event is a loser. Competition should serve as a reference point for athletes to measure progress.

Sometimes the pressures of competition can result in athletes setting goals that are unattainable. Goals that are too high guarantee failure even when the athlete performs well. Coaches should help athletes set realistic goals.

MOTIVATING AND COMMUNICATING WITH YOUNG ATHLETES

Sport psychologists have learned that two of the most important needs of young athletes are the need to *have fun* and the need to *feel worthy*. Certainly, it is easy to see when athletes have fun. They appear to be challenged, excited, stimulated and focused. They express feelings of enjoyment, satisfaction and enthusiasm.

Athletes also have a need to feel competent, worthy and positive about themselves. Sports can be threatening to young athletes when they equate achievement with self-worth. As youngsters, we learn quickly that others judge our worth largely by our ability to achieve. To win is to be a success and to lose is to be a failure. This attitude causes tremendous anxiety in young athletes.

Social evaluation and expectations of others are also major causes of anxiety. Athletes become anxious when they are uncertain about whether or not they can meet the expectations of their coaches, parents, peers, or even themselves. The more uncertainty athletes have, and the more important they perceive the outcome to be, the greater their feelings of anxiety.

The very nature of sports involves an extensive evaluation of the skills of the participants. Any situation involving social evaluation of abilities that a youngster considers important can be threatening if he or she anticipates failing or receiving negative evaluations. Most youngsters place great value on athletic competence and are particularly sensitive to appraisal of their abilities by others. Mistakes and errors which are a natural part of the learning process can be misinterpreted as failure or incompetence. These competitive pressures can result in youngsters setting unrealistic standards of near-perfect execution, which virtually assures they will fail.

A coach must help athletes meet their need to have fun by structuring their sport experience so it challenges and excites without being threatening. Motivated athletes have a strong desire to master skills and demonstrate their competence. Similarly, a coach can help athletes meet their need to feel worthy by creating situations where everyone can experience some degree of success. The continual process of achieving incremental goals that are challenging, yet attainable, provides motivation. When athletes experience a taste of success, it reinforces their feelings of mastery, competence, pride and self-worth. This in turn stimulates their desire to pursue new levels of personal achievement.

HELPING ATHLETES REACH FOR THEIR BEST

The ability to teach, communicate and motivate athletes is the *art* of coaching. Coaches should teach their athletes to focus on things they can control: their own performance and readiness to compete. When athletes worry about their opponents instead of focusing on things they can control, they limit their ability to compete well. Athletes who tend to worry about performance must be taught to focus on *what* they want to do (skill or strategy execution), instead of *how* they are going to perform against their opponent, the watch or the tape measure. Athletes should also recognize that winning is sometimes sabotaged by external factors beyond their control, such as an oncoming cold, bad weather, or outright bad luck. Over time these things even out, and they will be the beneficiaries of such occurrences as often as they are the victims.

Athletes should know it is all right to make mistakes. Many young athletes fear making mistakes because they have been ridiculed or punished for making mistakes in the past. Coaches must create a supportive atmosphere in which athletes view making and correcting mistakes as a natural part of the learning process. Some athletes become so frustrated and angry at themselves when they make a mistake during competition that they lose their composure and perform far below their abilities. Coaches should teach athletes that one of the things that separates champions from average athletes is the ability to let go of a mistake quickly and refocus on what needs to be done next.

Communicating is the most important thing a coach does. This fact cannot be overstated. Effective communication involves the explicit expression of instructions, expectations, goals, ideas and feelings. Doing so enhances mutual understanding and is the first step in meeting the athlete's and coach's needs. Communication is a two-way street: both coach and athlete must listen and speak to make it work.

A coach must be credible in the eyes of the athletes in order to communicate with them. Credibility is the perception of the trustworthiness of what is said and done. To be credible in the eyes of an athlete, a coach must be knowledgeable about track and field, enthusiastic about coaching well, and consistent and positive.

A positive coaching attitude projects a desire to understand athletes, accept them for who they are, and treat them with respect and affection. It requires refined listening, clear speaking and the ability to give feedback and constructive criticism in a nonpersonal and instructive manner. A positive approach is characterized by the liberal use of praise, encouragement and positive reinforcement. Constant criticism, sarcasm, or yelling at athletes will increase their anxiety over making mistakes, decrease their sense of self-worth, and discourage them from continued participation.

Another important component of a positive approach is empathy. It is not the same as sympathy. Empathy is being aware of the feelings and emotions of the athletes.

Coaches who are empathetic listen to their athletes and try to understand what is going on in their lives outside of athletics.

Praise must be sincere. When coaches are not sincere, they risk losing the respect of their athletes. It means little for athletes to hear "Good job" when in fact they know they have not done a good job. If the athletes or team have not performed well, the coach should be honest and acknowledge the fact they did not perform to their potential. However, athletes should also be complimented for things they have done well. Coaches should praise deserving efforts, not just final outcomes.

Attitude is the key to success. Athletes should know that champions expect to do well. Champions believe they will succeed and they recognize the important role that hard work and sacrifice plays in the quest for athletic excellence. Champions focus on goals and how to achieve them. They don't surrender their goals easily. They identify their areas of weakness and work hard to eliminate them.

Athletes should be taught the most important kind of success resides in their personal improvement, giving their maximum effort, being willing to take risks, and striving to do their best.

A coach needs to be there at all times to reassure athletes they are never losers when they give their best effort, an important lession that will see them through many of life's most difficult endeavors.

FINAL THOUGHTS

All athletes are unique. They may range from 13-year-old boys and girls to 18-year-old young men and women.

They come to a track and field program with different abilities, skill levels and personalities. They all have different backgrounds, attitudes, expectations and needs. One of the greatest challenges in coaching a sport such as track and field, which involves working with a large number of athletes, is being sensitive to individual differences and striving to make each athlete feel valued and important.

Finally, whether a coach is a full-time faculty member or a non-classroom coach, he or she should try to become an integral a part of the high school community. A coach should get to know the principal, front-office staff and fellow coaches, attend and ask to be part of any pep rallies or assembly programs during the season, and write to the athletes' teachers and tell them about the objectives of the school's track and field program and invite them to attend one or more home meet—be sure to include a schedule with accurate start times.

Having the support of the faculty, staff and administration can be invaluable, and the more all of those groups become familiar with the coach and the program, the greater the support will be.

THE USOC COACHING CREED FOR YOUTH SPORTS

1. Establish the well-being of your athletes as your #1 goal.
2. Use your sport to teach young athletes that victory and athletic achievement are meaningful only if achieved in a fair and sportsmanlike manner.
3. Teach young athletes by example to respect their opponents, the rules of the sport, and the role and judgment of officials.
4. Develop the competitive spirit of your athletes by encouraging them to "play to win." But remember young athletes should derive primary satisfaction from the experience of playing, improving, and attaining personal goals, which should not be limited to winning.
5. Be reasonable when scheduling practices and competitions. Young athletes need some time to be able to enjoy other worthwhile activities and interests.
6. Be sure your equipment and facilities meet safety standards appropriate for the age and ability level of your athletes.
7. Never yell at your athletes for losing or making a mistake. Young athletes should be able to participate in sports without fear of failure or ridicule.
8. Remember that young athletes thrive on enthusiasm and encouragement. Be positive and generous with your praise.
9. Avoid overplaying your most talented athletes. All your athletes need playing time, or experience in competition, to be able to develop.
10. Always follow a physician's advice when deciding when injured athletes are ready to resume practice and competition.
11. Get to know your athletes' parents and encourage them to become supportive volunteers for Get to know your athletes' parents and encourage them to your program. Educate parents and volunteers to understand that the physical and emotional well-being of young athletes can be threatened by programs that involve a high level of psychological stress and over-zealous parental supervision to win.

COACHES' CODE OF ETHICAL CONDUCT

A Show respect for athletes, officials, and other coaches.

B Respect the integrity and judgment of your officials.

C Establish standards , and be a model for fair play, sportsmanship, and proper conduct.

D Establish athlete safety and welfare as your highest priority.

E Provide proper supervision of your athletes at all times.

F Use discretion when providing constructive criticism and when disciplining athletes.

G Be consistent in requiring athletes to adhere to the rules and standards of the sport.

H Always instruct your athletes in the safe use of equipment.

I Do not exert undue influence on your student-athletes' decisions on which college or university they should attend.

J Avoid influencing student-athletes to take easier course work in order to be eligible to participate in high school athletics.

K Do not encourage or permit your athletes to use performance enhancing drugs.

L Do not recruit student-athletes from other schools.

M Enforce the rules of behavior and procedures for crowd control established by your conference and local board of education.

CHAPTER 2

Organizing a Track and Field Program

Organizing and directing a track and field program is an enormous coaching challenge. Track and field is a collage of seven technical sports: sprinting, hurdling, distance running, horizontal jumping, vertical jumping, throwing, and pole vaulting. Track and field should be the largest participation sport at every high school because it accommodates an almost unlimited number of athletes with various skills and combines seven individual sports into one team sport.

Responsibilities of a Head Track Coach

JOB DESCRIPTION

- Directs, organizes and supervises all aspects of a high school track and field program in accordance with the objectives and guidelines set by the principal and athletic department.
- Supervises assistant coaches and volunteers.
- Reports to athletic director.
- Serves at the pleasure of the principal.

THROUGHOUT THE YEAR

- Set a good example. The head coach should always serve as an appropriate role model for the athletes, the assistant coaches and all the other students in the school at all times.
- Formulate goals and objectives for the coming season of competition.
- Inventory all school track and field equipment and materials and advise the athletic department of what needs to be repaired, replaced and ordered for the coming season.
- Enhance and update the technical knowledge of the assistant coaches by providing them with reading materials and encouraging them to attend coaching clinics.
- Check with the school, league, section, state and the National High School Federation for any impending rule or policy changes that will affect the sport or the program and make the coaching staff and team members aware of those changes.
- Implement a preseason training program within the guidelines set forth by the school, league, section and state – all with the knowledge and approval of the site principal.
- Be active in professional coaching organizations.

PRESEASON DUTIES

- Oversee the enrollment of all prospective team members in a PE track and field class. Follow school procedures for adding students to those classes throughout the semester. If the school does not have a track and field PE class, the head coach should try to get one instituted.
- Make sure all assistant coaches (this includes volunteer, non-paid coaches) have met all school, district and section coaching requirements such as first aid training, coaching classes, fingerprinting, etc.
- Monitor the academic eligibility of all team members.
- Hold a meeting with the coaching staff to review the team policies, staff supervision assignments (including locker rooms and awaiting buses after practice), safety guidelines, emergency medical procedures, school policy for reporting accidents and procedures for issuing team uniforms and equipment.
- Review the meet schedule with the athletic director. Confirm that appropriate transportation needs are scheduled for all away meets.
- Send a letter to all opposing coaches for both home and away meets to confirm the date of the scheduled contests, official meet start time, the number of divisions to be contested, the number of athletes that will be allowed to participate in running and field events, and which events will or will not be contested (ie. discus, triple jump).
- Meet with the head of maintenance to confirm home meet schedule and what will be required to be set up for each home meet—be sure to include which gates need to be unlocked, if lights will be needed, and which bathrooms need to be cleaned, unlocked and stocked.
- Have a preseason meeting with the athletes and their parents. Introduce the coaching staff, preview the meet schedule, and discuss the objectives of both the team and coaching staff. Distribute copies of the team policies. Review the policies with them, answer any questions, and have each athlete return one copy signed by the athlete and his or her parents.

IN-SEASON DUTIES

- Organize, supervise and “coach” the assistant coaches, volunteers and student managers.

- Convey a high expectation for the individual efforts, attitudes and behavior of the athletes.
- Oversee the after-school and Saturday training sessions from start to finish.
- The head coach should not only script the daily training sessions on all the athletes he or she directly coaches but also review the training scripts of all the assistant coaches.
- Coach the assistant coaches to help them to become better coaches.
- Compete ethically and fairly.
- Organize all aspects of the home meets.
- Submit the team's entries for invitational meets by the receipt deadline and requisition the required entry fees.
- Check the academic standing and eligibility of all team members after each grading period.
- Have regular meetings with the team and coaching staff.
- Enforce the safety procedures to protect the well being of the athletes.
- Show genuine concern for the progress and success of every athlete. Treat all athletes as responsible young adults and provide them with enthusiastic leadership and positive feedback.
- Discipline every athlete in a firm and fair manner in accordance with athletic department guidelines. File a disciplinary action report with the athletic director and inform parents when appropriate.
- Continually communicate with the principal, athletic department and school staff.

POSTSEASON DUTIES

- Oversee the systematic return of all school uniforms and equipment.
- Hold athletes financially responsible for school equipment not returned according to athletic department policy.
- Complete the documentation required to provide school athletic letters and awards to the athletes.
- Submit a season summary report and a requested meet schedule for the next season to the athletic director.

- Oversee the storage of all track and field equipment, implements and materials.
- Hold a wrap-up meeting with the athletes to allow them to evaluate the season, critique the program, and offer suggestions for improvement. Encourage all freshman, sophomore and junior athletes to become involved in other school sports. Ask all your seniors if they would be interested in returning the following year to help as a volunteer assistant coach or to help officiate at home track meets.
- Hold a wrap-up meeting with the coaching staff to evaluate the season, critique the program, and implement new objectives and procedures for the next season.

The High School Coach’s Legal Liability

Due to the risks inherent in participating in sports, the high school coach has more liability exposure than any other individual in the school.

Today’s coaching liability lawsuits focus on these eight areas:

- Failure to provide *adequate advance warning* of the risk of injury involved in participating in school sports activities.
- Failure to have or to enforce *rules and procedures for safe participation.*
- Failure to provide *proper supervision* of an activity.
- Failure to provide and maintain a *safe playing area.*
- Failure to use proper coaching methods and provide *adequate physical conditioning.*
- Failure to provide *safe transport* to and from sites of competition.
- Failure to provide *proper instruction* for the use of athletic equipment.
- Failure to provide *proper medical care* to injured athletes.

HOW TO PROTECT ATHLETES AND LIMIT A COACH'S LIABILITY

- Advise all team members and their parents, in writing, of the potential risk of injury inherent in sports participation and have both the athlete and parent sign a consent and waiver/release form.

- Establish training safety rules and procedures for every event area with the coaching staff. Go over all safety procedures for all events with the entire team. Distribute a written copy of those procedures to all team members and have all team members sign a form signifying they were in attendance at the safety meeting and they received a copy of the safety procedures.
- Enforce safety rules and procedures.
- Develop a plan for dealing with a medical emergency during a training session or home meet.
- Supervise potentially dangerous training activities at all times (especially practice sessions for the throws, jumps and pole vault).
- Instruct athletes in the proper use of all equipment.
- Inspect and test all equipment before it is issued to or used by athletes.
- Be aware of the special medical history of each athlete (diabetic, asthmatic, allergic to bee stings, etc.).
- Inform administrators immediately and in writing when equipment and facilities are unsafe or inadequate.

Sexual Abuse in Youth Sports

The problem of sexual abuse of young athletes by adult coaches has gained increased attention in recent years. Many youth sports organizations have taken steps to combat the problem. The LA84 Foundation encourages all coaches to be aware of the issue and learn what steps to take if you suspect a problem in your youth sports organization. The Foundation also requires that all of it grantees have a written policy addressing their commitment to keeping their athletes safe from sexual abuse. For assistance in developing a policy, or to become more knowledgeable about protecting the safety of young athletes please see the Foundation's Resource Guide On Preventing Child Sexual Abuse in Youth Sports (http://la84foundation.org/1gm/ResourceGuide_frmst.htm).

Organizing a Track and Field Coaching Staff

The number of assistant coaching spots allotted by the school or district combined with the number of candidates available and their experience and expertise should determine the event coaching assignments of a high school staff.

Even if the school has separate boys' and girls' coaching staffs, it is strongly recommended the staffs be combined and the coaching responsibilities spread among the combined staff for the purposes of effectively training all athletes.

Track and field is viewed by many as a sport of coaching specialists. Track coaches are often times referred to as only a "jump coach" or the "distance coach" or the "vault" coach.

The problem is further exacerbated when track coaches themselves only see their role as one of the "high jump coach" or the "hurdle coach." There is virtually no other sport where coaches perceive themselves as only "knowing" one aspect of their sport. There certainly are specialists in other sports such as an offensive coordinator in football or a hitting coach in baseball, but even those coaches know some, if not a considerable amount, about the other facets of their sport.

It is certainly a challenge for any track coach to master the complexities of one event area; furthermore, the coaching sciences of exercise physiology, biomechanics, nutrition, and sports psychology are constantly providing coaches with effective new methods of training and preparing; however, that doesn't mean track coaches, especially head coaches, should become isolated and solely concentrate their efforts into one event area.

A head coach should feel an obligation to work towards becoming reasonably proficient in coaching every event area, so he or she can not only train new assistant coaches when necessary but also serve as a second set of "eyes" or another resource for experienced assistant coaches. Furthermore, there may be years where the head coach may find he or she has an assistant coach that can only coach the same area as the head coach but no other area, and in that case, the head coach may best serve the needs of the program by coaching another event area.

All assistant coaches should make an attempt to begin to learn at least one more event area. There will certainly be times both in practice and meets when an event area coach has some free time where he or she could help other event area athletes, especially beginning athletes who are just learning the basics of their events. Additionally, it serves to bring a team closer together when the assistant coaches have a good relationship with all the athletes, not just the ones in his or her event area.

The process of learning a new event area should be viewed as a long term project for assistant coaches. To learn a new event, a coach should begin by attending clinics, reading books, and by watching other exemplary coaches during practice and meets. He or she should then try to pick up the basics of technique first, and then an understanding of training later.

BUILDING A STAFF

Often times, the first job a head coach will have is recruiting assistant coaches. In recruiting assistants, it is often better to choose inexperienced coaches with enthusiasm and personality who are anxious to learn rather than individuals with track and field expertise who lack leadership and communication skills.

New coaches often want to train with their athletes. This is not a good idea. Aside from the temptation to do their own training rather than the training their athletes need, it severely limits a coach's ability to organize, observe and critique a training session. It is an especially bad idea for running event coaches. Coaches who run with their athletes lose all perspective of the performance of those running behind them and are thus unable to coach the less advanced athletes who need their evaluation and encouragement the most.

It is best to begin training novice coaches by having them observe the head coach or another experienced assistant coach working with athletes in their event area. The next step is to have the novice assist in directing specific parts of several training sessions (the head coach should tell the novice in advance what to do and for what to watch). Finally, when the new coach becomes familiar with the system of instructing and organizing athletes, the head coach should give the new coach a script prior to each day's training and let the new coach administer the workout. (A sample training session script form is included in each event chapter of this manual.)

This would be a suggested breakdown of event coaching assignments for a staff of six coaches:

- Sprint Coach — 100m, 200m, 400m, 400m Relay, 1600m Relay
- Hurdles Coach — 100mH, 110mH, 300mH
- Distance Coach — 800m, 1600m, 3200m

- Jumps Coach — Long Jump, Triple Jump, High Jump
- Throws Coach — Shot Put, Discus
- Vault Coach — Pole Vault

The next best breakdown would involve five coaches:

- Sprint/Hurdle Coach — Sprints, Relays and Hurdles
- Distance Coach — 800m, 1600m, 3200m
- Jumps Coach — Long Jump, Triple Jump, High Jump
- Throws Coach — Shot Put, Discus
- Vault Coach — Pole Vault

The next breakdown would involve four coaches:

- Sprint/Hurdle Coach — Sprints, Relays and Hurdles
- Distance Coach — 800m, 1600m, 3200m
- Jumps Coach — Long Jump, Triple Jump, High Jump, Pole Vault
- Throws Coach — Shot Put, Discus

And finally, the best breakdown for three coaches:

- Running Event Coach — Sprints, Relays, Hurdles and Distances
- Jumps Coach — Long Jump, Triple Jump, High Jump, Pole Vault
- Throws Coach — Shot Put, Discus

These coaching assignment breakdowns recognize that field events are the most technical events in track and field and require the greatest amount of instructional time to achieve mastery, and the most direct supervision to ensure safety.

*A track and field program cannot provide coaching for athletes in 15 events with less than **three coaches**!* Use the issues of supervision, safety and athletes per coach to lobby your school's administrators to increase the number of paid assistant coaches allotted for the track and field program.

Planning and Scripting Training Sessions

Each daily training session should meet the needs of your athletes while making the best use of your practice time and coaching staff.

If you have an experienced coaching staff, each coach should be responsible for planning and scripting each day's training for his or her respective event area. Head coaches should give inexperienced coaches a script for each day's training and have them administer the workout. Communication and cooperation among coaches is essential, especially when athletes are working with more than one coach to train for multiple events.

Each athlete on the team should be designated as a *specialist* in one event area – this is probably going to be the event in which the athlete will compete during the championship part of the season. The coach responsible for that event area should then become the athlete's "primary coach"—the coach responsible for coordinating that athlete's entire training program for the season.

The athlete should begin each training day by checking in with the "primary coach" to find out what that day's training will be. The primary coach should have already discussed with the other coaches on the staff when and to what extent his or her athletes will work that day with those other coaches in their event areas.

At the end of the training day, the athlete should once again check in with his or her "primary coach." In fact, there may be some days where the athlete will spend the entire training day with another event area coach; however, the primary coach will always know exactly what type of practice and what type of workload the athletes completed, so the next day and following week's training can be appropriately planned.

A hard day of training should be followed by an easier day so the athlete can recover before beginning another quality training session. Multi-event athletes who go from one coach to another without a coordinated training plan are extremely vulnerable to injury and burnout. The head coach may have to be an arbitrator for the training schedule of a star athlete who competes in several event areas.

Placing athletes in the right events is oftentimes the difference between winning or losing a close dual meet. Lineups should be planned, distributed to the coaching staff and posted for the athletes as far in advance of the meet as possible…one week at a minimum.

Once a meet lineup is set, only the head coach should ever make a change. An assistant should never remove or add an athlete from an event without discussing it with the head coach first. This is not a matter of maintaining a protocol or a "pecking order", it is a matter of making practical decisions that can affect a team.

For example, if an assistant coach adds an athlete to an event, it may be the fourth event of the meet for the athlete and he or she may no longer compete in any other events. The head coach may have been saving that athlete as a back up to run a leg in a relay for another athlete who was nursing an injury. Conversely, if two or even three assistant coaches pull athletes out of events, then all of the sudden a meet that was not suppose to be close, becomes so.

Preparing for the Season

At the end of each track season, it is important that coaches assess the condition of their facilities and equipment and inventory their implements and team uniforms for the following year. Requests for facility improvements, repairs, and new equipment usually must be submitted to a school or district prior to the end of the previous school year.

However, if no requests were made at the end of the previous year, those requests should be made as soon as possible in the current school year. Funding sources become available at odd times during the year, and principals have some leeway in determining how that money will be spent. If a coach has a request sitting on the desk of the principal when new money becomes available, there is a chance the proposal will be funded. If any coach is waiting for the principal to come ask if there is anything the team needs, that coach may be waiting for a long time.

The following pages list items that should be assessed and inventoried at the end of the previous track and field season. Copies of these assessments should be given to both the site principal and athletic director. It is imperative that coaches provide administrators with written documentation as to what is *unsafe or inadequate!*

RECRUITING TEAM MEMBERS

Recruiting students to become a part of the track and field program at the school should be a year round obsession for the head coach, the assistant coaches, and every current member of the team.

It may seem at first as though track and field may be at a disadvantage in the fact that most high school students have never participated in the sport as a youngster, as they may have with soccer, volleyball, baseball, basketball or football. They also may never have even seen a track meet in person or on TV; however, that can be a huge advantage.

Today, many high school students have already been turned off to those other sports because they either did not enjoy them as kids or overzealous fathers or coaches weaned them out before they had a chance to blossom. They have already had it drilled into their heads by age 13 that baseball or basketball or soccer is not for them. Those kids are looking for something in which to become involved.

Track and field offers every single student in a school a level playing field from which all athletes may begin anew. Who has pole vaulted before high school? How many kids have ever seen a discus? What makes up a triple jump? That is how the program can be sold. Kids should be told over and over again that any one can be successful at this sport. You don't have to be tall or strong or even fast, and you certainly do not need experience. It just takes work, and coaches should let kids know they know how to take average kids and make them successful.

Furthermore, coaches should go after the great athletes also. Recruit to track and field's strengths. Tell the lineman who toils in the obscurity of the mud that in track he will shine in the discus ring. Tell the basketball player who never gets to shoot that she can be league champion in the high jump. Tell the soccer player that the previous 10 years of running have developed an incredible VO2 MAX and she will shine as a distance runner.

No one should be overlooked. A coach can never tell by simply looking at a group of kids standing in the halls which student will be a fast sprinter, who will be a great thrower, who will recruit even more kids to come out, or whose life will be changed by becoming involved in a sport which rewards hard work.

Once the snowball starts rolling down the hill, it will get larger and larger. The more successful and visible any extracurricular program is at a school, the more likely it will attract students to join. This is especially true with track and field.

Track coaches should look to a variety of sources for potential recruits.

One great place to look is in the sports that have their seasons prior to track and field.

Certainly, excellent football, volleyball, basketball and soccer players should be identified, and several track coaches and teammates should begin talking with those athletes about coming out for track.

Ironically, another great place to find potential recruits is in the lists of the athletes who did not make the basketball, soccer or wrestling teams. Track is a great place for those kids—they already have demonstrated they want to be on an athletic team, they have already been cleared to try out, and most of the time they are decent athletes whose bodies have just not yet physically matured or they just don't have the experience some other students have in that other sport.

The track coach should make an effort to find out when "cuts" are made in those sports and be there at that moment to pick those kids up and get them involved in the off-season conditioning program for track and field.

Another recruiting "gold mine" is to institute a PE Track and Field Unit at the school. Even if the track coach is not a physical education teacher, he or she can set up a unit that takes the students through the basic events of sprinting, hurdling, jumping and throwing. The track coaching staff can help by making sure all the implements and equipment are readily available and easy to use; furthermore, the staff can provide a simple in-service for the teachers in the PE department to show them just a bit about technique. If the head coach or any of the assistants are not classroom teachers, they should offer to come help during the school day with the track PE class.

The only thing the track coach should ask for in return is for the PE teachers to make a list of the names of the top kids in each event in their classes. Those names should then be posted everywhere for everyone to see; furthermore, those kids on the lists should get a personal invitational from one or more of the track coaches to come out for a sport they now know they already can do well.

The best recruiters may actually be the other members of the team. They know the better skilled athletes in the school, and they should be encouraged to help recruit new team members, or at the very least identify them for the coaching staff.

More Ideas to Recruit Track and Field Athletes

- Get a list of the USATF youth track clubs in the area. Ask the coaches for their rosters and for permission to talk to their kids about the high school program.

- Do the same at the junior high schools in the area. If there are rules that prohibit a high school coach from recruiting at the junior highs, the track staff should offer to put on an all-school assembly program with track and field demonstrations for them.
- Send a letter to the school's incoming freshmen inviting them to join the track and field team.
- Get to know which of the current team members have younger brothers and sisters.
- Ask the school's counselors to encourage their students to join the team.
- Ask coaches of other sports to recommend their athletes participate in track and field in the spring. Demonstrate to those coaches that having their kids involved in track will improve the physical abilities of those kids so when they return to their original sport they will be better athletes.
- Ask to speak to the PE classes at the school.

How to Promote Track and Field at Your School

- Put together a good coaching staff. If no one with track and field expertise is available, recruit popular teachers and train them to be track coaches.
- Make track and field the largest athletic team at the school! Emphasize that fact with the administrators when lobbying for increased financial support for the program.
- Don't cut anyone! A program can never have too much depth; furthermore, successful track and field athletes can be built over time. Ninety-nine-pound freshmen develop into 170-pound seniors, and 13-year-old children become 18-year-old young adults.
- Have a large, visible track and field bulletin board located where everyone in the school is going to see it. Keep it up to date with photographs, newspaper clippings, lists of top performers, etc.
- Have a large, visible track and field record board. Showcase the varsity school records by posting them in larger print than the frosh/soph records.
- Start a parents' boosters club. Get the parents involved in helping to raise money and to help push the administrators for facility improvements and new equipment.
- Email a track newsletter to everyone.

- Videotape the meets and show them during school lunch periods.
- Present small prizes (such as Halloween candy bars) each time an athlete sets a new personal best. Give special certificates for new school records.
- Have an awards banquet or potluck at the end of the season.
- Become friends with the maintenance staff and school secretaries. They are the ones who run the school.
- Get publicity for the program in your local paper by writing articles and submitting them with some photographs.
- Have one or more of your "techie" students create a maintain a track and field web site.
- Upgrade the school's track and field facilities. Be a "squeaky wheel" with the administrators and push them for a metric track; all-weather runways; top quality jumping pits, standards and throwing circles; and a bigger budget for the program.
- Set some realistic goals for the team each season and create some clamor when they are achieved.
- Make the program *fun!* Plan recreational events such as having a pizza night with all the kids' parents after a home meet.
- Make home meets the best meets on the schedule. Recruit and train faculty members as officials. Provide them with hats and jackets. Have a PA system and a good announcer. Host an invitational meet. Be creative and make the invitational format something unique (e.g., girls only, frosh/soph only, mixed events, all relays, etc.).

How to Keep Athletes Healthy

- Coaches should plan and periodize an athlete's training. Training volume and intensity should be matched to the age and fitness levels of the athletes. Stair-step training volume and intensity (e.g., 45 miles one week, followed by 30 miles the next week, followed by 50 miles the next week, etc.).
- To increase training mileage, do two shorter runs a day, rather than one long run. Do no more than one long run of 10-12 miles or more a week.
- Do no more than one intense repetition or interval workout a week, or three such sessions within two weeks.

- Allow a minimum of one day of complete rest every 14 days. Group athletes in training so that older, more mature runners don't run the younger ones into the ground. Choose Saturday competitions carefully. Training is critical to the development of athletes, and they cannot train much if a meet is scheduled every Thursday and Saturday for 16 weeks. Maximize bouts of training, minimize bouts of competition.
- Don't double or triple distance runners in the 800m, 1600m and 3200m to score points in dual meets more than absolutely necessary.
- Be sure athletes train in good shoes. Do most of the training in training flats, not racing flats or spikes.
- Ask athletes to inform a coach if they are chronically sore or hurt. Athletes should never fear repudiation for telling a coach they are hurt. Coaches should talk to the administrators of a physical therapy center in the area and ask them to become community partners in helping treat and manage the athletes' injuries early, *before* they become disabling.

Sample Team Guidelines (Distribute to Athletes)

Academic Eligibility

In order to participate in athletics, you must meet the school and the district's minimum standards for participation (each school should input it own standards here).

Your grades and conduct in school reflect on our team. We want you to take advantage of the opportunity we are giving you to become the best student and the best athlete you can be. If you are having problems in any of your classes, let us know immediately and we will try to get you some tutoring help.

Practice Attendance

We expect you to be at training every day, on time! Our daily training sessions usually end by 4:30 p.m.. Be dressed and ready to go by 2:00 p.m.. Check the track bulletin board every day before practice to see where to assemble with your primary coach.

If you are detained by a teacher or another school club activity, you must bring a note signed by that teacher or sponsor to be excused for being late to training. These delays should occur no more than two or three times a semester.

If you are unable to attend school because of an illness, a doctor's appointment or a family emergency, you or your parents must call to inform the coach of your impending absence that day by 12:00 noon. My office phone number is 123-4567. If you have an unexcused absence from training, you will not be permitted to compete in our next meet.

Physical Examinations and Insurance

All members of (your school) athletic teams must meet the school and district minimum standards for medical clearance. (Each school should input it own standards here.)

Team Uniforms

You will be issued a competition singlet, running shorts and a team warm-up suit. These are the property of (your school) and must be returned at the end of the season. You will be billed for the replacement cost of any equipment you do not return.

Shoes

You will need to buy a track bag for all your gear and a pair of training and/or racing spikes for competition and training. Ask your coaches for specific recommendations before you purchase training or competition shoes. You will also need a set of replaceable spike elements for the dirt and all-weather surfaces on which we compete.

Home Meet Procedures

Every week our team lineup sheets will be posted on Monday. The sheet will indicate when to begin warming up for your event(s). Your preparation for competition should follow the same sequence as your every day training: running warm-up, stretching-rhythm drills and buildup runs. Your warm-up should conclude approximately five minutes before the start of your event.

Meet-Day Preparations

Get a good night's sleep the evening prior to the meet, but do not alter your routine by going to bed at 7:00 p.m. if you normally turn in at 10:00 p.m..

Use common sense and don't eat anything that tends to disagree with you the night before or day of a meet. On meet day eat a light lunch. If your lunch period is too close to your race time, eat your lunch earlier.

Put the proper length spikes in your shoes the day before the meet. Double check your track bag to be sure you have everything. Have your own spike wrench or vice grips in your bag for last minute spike changes. Write your name on every piece of equipment you have! Jumpers should have a personal runway marker to mark their approach such as a tennis ball or Whiffle ball with a long nail or pencil through it.

Away Meet Procedures

The buses will leave school at 1:20 p.m. sharp! Travel time may occasionally require us to leave sooner. Report to the bus dressed to compete with all your equipment. If you need to see the trainer, take care of it at the beginning of your lunch period.

When we arrive at the meet, we will designate a spot for our team area. Stay in our team area during the meet when you are not competing, warming up, or cooling down. You are not to wander around the school or leave campus! At the conclusion of the meet, we will reassemble in our team area, then move to the buses for departure back to school.

OTHER TEAM POLICIES:

- We will have a team meeting every Wednesday before practice at 2:30 p.m. sharp.
- You must dress for training every day in proper T&F apparel.
- You may not leave training until you are dismissed by your primary coach.
- At our home meets, everyone stays until the conclusion of the last event.
- You may not compete in any track and field meet or road race that is not on our school schedule without your coach’s approval.
- You are financially responsible for any equipment that is issued to you, including batons, shots, tape measures, etc.

TRACK & FIELD FACILITIES ASSESSMENT

Key:

(US)= UNSAFE/NEEDS REPAIR
[US]= UNSAFE/NEEDS REPLACEMENT
E = EXCELLENT CONDITION
G = GOOD CONDITION
P = POOR CONDITION

____Surface of track

____Drainage of track

____Curbing of track

____Surface of shot circles

____Toeboards on shot circles

____Markings on shot circles

____Surface of discus circles

____Rings on discus circles

____Markings on discus circles

____Surface of long jump/triple jump runways

____Takeoff boards on long jump/triple jump runways

____Sand in long jump/triple jump pits

____Depth of sand in long jump/triple jump pits (12″ minimum)

____Approach area for high jump

____High jump landing pits

____Pads for high jump standards

____Surface of pole vault runways

____Pads for pole vault standards

____Pole vault boxes

____Pole vault landing pits

Notes:

TRACK & FIELD EQUIPMENT INVENTORY

Need: Have: (in good condition)

____ ____ Hurdles
____ ____ Hurdle carts
____ ____ Starting blocks
____ ____ Mallets for starting blocks (dirt track)
____ ____ Block cart
____ ____ Lap counter
____ ____ Lane markers: ___1 ___2 ___3 ___4 ___5 ___6 ___7 ___8
____ ____ Indicator boards (for height or distance):
____HJ ____PV ____LJ/TJ ____Shot put ____Discus
____ ____ Pennants flags to rope-off shot/discus landing sectors: ____feet
____ ____ Throwing sector marking tape: ____rolls ____ground staples
____ ____ Distance markers for shot/discus
____ ____ Rakes for LJ/TJ pit
____ ____ Shovels for LJ/TJ pit
____ ____ High jump crossbars (4m in length)
____ ____ Pole vault crossbars (4.5m in length)
____ ____ Stopwatches
____ ____ Batons
____ ____ Track & Field scorebooks
____ ____ Megaphones
____ ____ Officials' flags (red & white)
____ ____ Boys' shots (12lb)
____ ____ Girls' shots (4kg)
____ ____ Boys' discus (1.6kg)
____ ____ Girls' discus (1kg)

TRACK & FIELD UNIFORM INVENTORY

Sizes:	SM		MED		LG		XL		XXL	
NEED/HAVE (in good condition)	**N**	**H**	**N**	**H**	**N**	**H**	**N**	**H**	**N**	**H**
boys' singlets										
boys' shorts										
girls' singlets										
girls' shorts										
practice sweat tops										
practice sweat bottoms										
meet warm-up tops										
meet warm-up bottoms										

Notes:

Date completed:

Coach's signature

cc: Principal
Athletic Director

IDENTIFYING POTENTIAL ATHLETES

Event	What to Look For
LONG AND TRIPLE JUMPERS	**Long legs, excellent vertical jumping ability, good speed:** Vertical jumping ability is a much better indicator of long and triple jumping potential than high jumping potential. This is because an athlete must create a great moment of force at takeoff to jump high vertically or long horizontally, while the universal flop technique of high jumping employs takeoff mechanics of transfer of momentum. The ability to create horizontal velocity (speed on the runway) is another important asset for long jumpers while long leg levers are an obvious asset for triple jumpers. Good horizontal jumpers can often sprint or hurdle as second events.
HIGH JUMPERS	**Tall, lean body-type, good coordination and sense of rhythm:** Being tall and thus having a high center of mass is an advantage in an event where you have to raise your center of mass several feet off the ground to snake backward over a horizontal cross-bar! More than speed or explosiveness, the high jump requires a rhythmic transfer of horizontal velocity into a vertical takeoff, clearance and landing. Good high jumpers can often hurdle or triple jump as second events.
THROWERS	**Large, athletic body-type with a "good arm":** The throws are the most technical and explosive events in track and field. It is not unusual for a good shot putter, in particular, to be able to run stride-for-stride with a good sprinter for 30 to 50 meters. Body mass and long arm and leg levers help propel the mass of the shot and discus. But more than size and strength, the throws require great timing, coordination and agility to accelerate the implement across the circle. Most of all, shot putters and discus throwers must have a good arm. Examples of a good arm include the ability to rocket a volleyball serve into the backcourt from 15 feet behind the end line, the ability to throw a football 50 yards downfield, or the ability to throw to home plate from deep center field. You can train athletes to be strong enough to lift up one end of the weight room, but if they cannot post on their opposite leg, lead with their hip, torque-drag their arm through, release and reverse, they will never develop into shot putters or discus throwers.
POLE VAULTERS	**Aggressive athletes with all-around ability:** The pole vault requires more all-around athletic ability than any other track and field event. Pole vaulters need to have the arm strength of a wrist wrestler, the speed of a sprinter, and the agility of a gymnast. Most important, pole vaulters must have a passion for catapulting themselves off the ground as high as they can onto their backs! Good pole vaulters can often sprint, long jump, or hurdle as second events.

IDENTIFYING POTENTIAL ATHLETES

Event	What to Look For
HURDLERS	**Above average height, good sprinting ability, agility, aggressiveness and mental toughness:** The hurdles require special athlete personalities. Male 110m hurdlers should be above average height or have a high split, but all hurdlers must have a mind-set to attack the hurdle, not merely negotiate it. Hitting hurdles is part of being a hurdler, and athletes have to be tough and aggressive enough to ignore bruises and scrapes and an occasional fall. Tall, lean athletes with league champion sprint speed can develop into state champion hurdlers. Introduce them to the hurdles first! You will quickly see whether they possess the personality and ballistic agility to become hurdlers. If not, they can always move on to the sprint events. Good hurdlers can usually run the sprints, relays, or compete in the jumps as second events.
DISTANCE RUNNERS	**Small, lean body-types, tenacious workers, good students:** Small, lean body-types are not well suited for most other sports or track and field events, but they can develop into great aerobic athletes. It requires an extraordinary amount of persistent, dedicated training to become a good distance runner. Distance runners have to be self-motivated and able to see success at the end of a long path of development. Good students usually have all of those personality traits.
SPRINTERS	**Strong, muscular body-types, self-assertive or having a reputation for outstanding sprint speed:** Sprinting is a power activity. Sprinters have to be able to apply a great amount of force to the ground repeatedly, in very short moments of time, for 10 to 50 seconds. Most sprinters either have muscular body-types or a predisposition to become so with training. In scouting other sports for potential sprinters you should realize the difference between "quickness" and track speed. To run with great speed over 100 to 400 meters, sprinters must accelerate for 50 to 60 meters, then decelerate as little as possible over the remaining distance. Running speed is probably the most easily recognized athletic skill. By the time youngsters get to high school, they know from their neighborhood contests whether they have superior running speed. If you ask what events they would like to try, the fastest will tell you, "I'm a sprinter." Good sprinters can usually long jump as a second event.

EVALUATING YOUR PROGRAM

As a guide for evaluating your program throughout the season, consider the following 15 questions:

1. What are our goals?
2. Are we improving and making progress?
3. Are we organized? Are our training sessions well-planned?
4. Is our training what we need?
5. Is our program fun?
6. Do we look and act like a team?
7. Are we always appropriate role models as coaches?
8. Are we in touch with our athletes? Do we listen?
9. Do we treat every athlete with dignity on a first-name basis?
10. Are we fair, firm and consistent in dealing with our athletes?
11. Are we teaching our athletes to be self-disciplined and responsible?
12. Are we protecting the safety and well-being of our athletes?
    - Good equipment & facilities
    - Safe training practices
    - Proper supervision
    - Prepared for emergencies
13. Are we showcasing our program in our school?
14. Do our home meets promote track and field as a spectator sport?
    - Efficiently managed
    - Well-officiated
    - Quick-paced
    - Informative PA announcing
15. Do we work as hard as our football and basketball coaches?

CHAPTER 3

Principles and Methods of Training

To train athletes, a coach must have an understanding of the basic principles that govern a human being's physical and mental response to training. Intelligently and systematically applying a basic knowledge of biomechanics and physiology helps create good track and field athletes. The training a coach devises will become a recipe that combines conditioning, mobility and flexibility training, strength and plyometric training and specific event technique. Only in this way does optimum performance become a matter of planning, not happenstance.

Teaching Track and Field Skills

Every track and field event involves technical skill. Some events are more complex than others, but even distance running involves proper mechanics and movement skills.

There are several immediate challenges in coaching athletes new to track and field.

- Evaluating the skills they bring to the sport.
- Matching them to the event area(s) where they can experience the most success.
- Teaching them a progression of skills that will enable them to achieve a level of proficiency.

Among any group of novice athletes, some will be more skilled than others, some will have multiple skills, and all will have a somewhat different rate of learning.

The actual instruction of a skill should involve the following:

- a demonstration
- an explanation
- an attempt of the skill
- a critique of the attempt

A coach does not have to be able to demonstrate a skill with great proficiency to be able to teach it well. The coach does, however, have to be able to break down skills to their simplest elements, know what is mechanically correct, and detect and correct mistakes.

If a coach is not capable of demonstrating a skill, one of the better athletes on the team can be used as a demonstrator.

When demonstrating, the coach should repeat the demonstration several times while explaining the skill. The initial skills should remain simple, the explanation should be simple, and the athlete should be given plenty of time to practice the skill.

While the athletes are practicing the new skill, the coach should correct mistakes by using the same verbal cues he or she will use throughout the season. The feedback should to be positive, precise and verbally accurate.

Coaches should not try to correct more than one fault at a time while at the same time always looking to praise the things the athletes are doing well. Coaches should be liberal in their use of praise and encouragement.

When progressing to more complex skills, the coach should begin by going back to a simpler skill or a drill that utilizes several component skills. When athletes fail to pick up a new skill or drill, the coach should break it down to its simplest components or go back to a less complex skill.

When trying to work with a large group of athletes attempting a new skill or drill, they should be divided into groups by ability, regardless of their age or gender. Athletes will feel more competent and successful working with others of similar skill levels. Experienced athletes can be used at the front of each small group as an example of how the drill should be done.

Athletes should be arranged in flights of no more than three so the coach can effectively observe and critique them. As athletes begin to master the skill, they should be encouraged to help teammates who are having difficulty.

Athletes should always try to identify the specific skills they need to practice on their own. They should be challenged to take on the responsibility themselves for mastering their events.

BASIC BIOMECHANICS FOR TRACK AND FIELD

Certain physical laws govern all motion. The sport of track and field is no exception. On the contrary, in a sport whose essence is the most efficient and forceful expression of human movement, these physical laws continually reveal themselves. For this reason, the coach must be familiar with how the laws of physics govern athletic performance. This relationship is called biomechanics.

BASIC BIOMECHANICAL PRINCIPLES FOR TRACK AND FIELD

The science of biomechanics explains how movement is affected in the track and field athlete's attempts to run faster, jump higher or longer and throw farther. To teach, observe and correct technique, the coach must have a general understanding of these principles. To teach any athletic skill properly, the coach must correctly apply basic biomechanical principles to an athlete's training.

Following is a short discussion of some of the most important principles affecting track and field performance.

THE LAW OF INERTIA (NEWTON'S FIRST LAW)

"Every body continues in its state of rest, or of uniform motion in a straight line, except in so far as it may be compelled by impressed forces to change that state."

In other words, a body at rest will remain at rest unless put into motion by some force. Conversely, a body that is in motion will remain in motion unless brought to rest by an opposing force. However, in terms of increasing the speed of an object, inertia still must be overcome. In relation to inertia, rest and uniform motion are the same thing.

LINEAR MOTION

- Linear motion is the movement of a body along a straight line with all its parts moving equal distance and direction at the same time. Track and field events rarely exhibit pure linear motion, but every event involves some form of it.
- Linear motion is measured by two parameters: speed, or rate, of motion, (e.g., 9 meters-per-second) and direction.
- The measure of speed in a particular direction is velocity. Many track and field events involve the application of force or speed in multiple directions. The high jump is an example. As the athlete jumps, vertical velocity carries the jumper over the height of the crossbar. At the same time, horizontal and angular velocity carry the jumper from the takeoff point into the landing pit. Linear motion also is measured by changes in velocity.
- A positive change in the rate of motion is termed acceleration; a negative change (or slowing) is negative acceleration, or what is commonly called deceleration.
- An important measure of acceleration is the gravitational constant. All bodies, regardless of weight, fall with a constant acceleration (or increase of speed) of 32 feet-per-second. This law is fundamental to understanding the trajectories of jumping and throwing.

ANGULAR MOTION

Angular motion is often known as rotation. Angular motion is the movement of a body around a fixed axis, resulting in a circular pattern. An axis is the imaginary point or line around which the motion of the body occurs. The human body is considered to have three primary axes which pass through its center of mass:

- the **longitudinal** (head-to-toe)
- the **transverse** (side-to-side)
- the **frontal** (front-to-back)

When a body rotates around two or more axes simultaneously, such rotation is called **nutation**. A discus that wobbles during flight is in nutation. Most movement of the human body is a combination of linear and angular motion.

THE LAW OF ACTION AND REACTION (NEWTON'S THIRD LAW)

"To every action there is an equal and opposite reaction; or the mutual actions of two bodies in contact are always equal and opposite in direction."

In other words, "for every force there is always an equal and opposite force acting in an opposite direction." When an athlete applies force to the ground, it reacts with an equal amount of force or resistance. If the force applied is greater than the athlete's weight, it will cause the athlete to accelerate away from the ground. This acceleration may occur vertically, horizontally, or in combination.

TRANSFER OF MOMENTUM

As a body accelerates, it acquires momentum (mass x velocity). If that acceleration is suddenly stopped, the acquired momentum must transfer to another object or part of the body. The transfer of momentum plays a significant role in the execution of several track and field events. In the high jump, for example, momentum from the drive of the free leg and the arms is transferred to the body, resulting in a stronger impulse off the ground. In the throws, blocking the free side before release results in greater angular momentum being applied to the implement.

CENTER OF MASS

An object's center of mass is the point in space around which the object's mass is concentrated. Center of mass is often referred to as the center of gravity. In a solid object, such as a shot, the center of mass is stationary and located near its center.

With a human body, however, the center of mass changes relative to the position of the body. In a normal standing position, the body's center of mass is just above or below the navel. As body positions change, however, the center of mass shifts. During the performance of many track and field events, the center of mass is actually located outside the athlete's body. To be balanced, the body's center of mass must be above at least some portion of the base of support. In biomechanical terms, the act of running can be defined as a continuous and frequent forward shifting of a person's center of mass. Likewise, jumping can be described as the propulsion of a body's center of mass away from its base of support.

CURVES OF FLIGHT

When an object is put into flight, the path of its center of mass is fixed once it leaves the ground. The center of mass follows a parabolic curve that remains unaffected by any action of the body in the air. That parabola is determined by horizontal and vertical velocity along with the effects of gravitational acceleration toward the ground. Although the path of the center of mass is determined once the body leaves the ground, movement of the body can affect its position relative to its center of mass. This allows jumpers, for example, to increase their performance by moving their bodies forward or above the paths of their centers of mass.

The optimum angle of projection of an object to obtain the maximum distance in flight is 45-degrees. This is true only if the point of landing is at the same level of altitude as the level of projection. (Try experimenting with a garden hose turned on to a constant stream.) In track and field, however, this is never the case. The level of projection is always higher than the point of landing. When the level of the point of projection is higher than the point of landing, the optimum angle of projection of an object decreases. The difference in height levels reduces the amount of vertical velocity necessary to achieve maximum distance.

Aerodynamic qualities also affect the flight curve of an object, thereby altering the optimum angle of projection. The aerodynamic nature of a body has the effect of lowering the point of landing. Air resistance as a body descends works to keep it aloft for a greater period of time, so the optimum angle of projection decreases.

AIR RESISTANCE

Air resistance plays a significant role in track and field. Resistance in the form of a tailwind or headwind substantially affects times in the running events. Though a tailwind enhances speed, a headwind has an even greater effect in reducing speed. In the jumping events, wind affects both speed and accuracy. In the discus, wind and air resistance greatly affect the aerodynamic behavior of the implement.

ANGULAR MOTION IN THE AIR

When an athlete leaves the ground, there is almost always some rotation around a primary axis. This rotation is caused by eccentric thrust, an application of force away from the center of mass. Airborne rotation is most easily seen in the jumping events, but occurs in running and throwing as well. Angular motion that is initiated by movement in the air results in an opposite reaction of the body. This explains the behavior of a jumper's body during flight.

THE CONSERVATION OF ANGULAR MOMENTUM

Resistance to a change of inertia in angular motion depends upon the distribution of an object's mass around its axis. The resistance of a given mass is directly proportional to its distance from the axis. This phenomenon reveals itself often in track and field, from the arm carriage of a sprinter to the free arm pull of a shot or discus thrower.

CENTRIFUGAL AND CENTRIPETAL FORCE

Centrifugal and centripetal forces are the forces that pull away and toward an axis of rotation. The balance of these forces is what keeps a runner on the curve during a race. The proper use of centrifugal force in the high jump enables the jumper to achieve the necessary rotation to carry him or herself from takeoff into the landing pit.

APPLYING BIOMECHANICS TO THE RUNNING EVENTS

The running stride has three phases:

- Drive
- Recovery
- Braking

The drive pushes the body forward off the supporting foot. The recovery phase occurs when both feet are in the air. The braking phase begins as the lead foot touches the ground, causing a momentary braking or slowing. As the body's center of mass passes in front of the foot, the next stride and drive phase begins.

Running speed is a function of two things: stride length and stride frequency. However, increasing stride length by over-striding reduces speed because it increases the time of the braking phase. Conversely, overly short strides, or under-striding, may increase frequency but still reduce speed because of the decrease in stride length. Stride length is determined by leg length, leg strength and running mechanics. Stride frequency (the time required to complete a running stride) is a function of leg length, genetic factors and training.

The most effective way to increase running speed is to increase stride length while maintaining frequency and efficient running mechanics. Other variables being equal, a one inch increase in stride length would result in a gain of four feet in a 100-meter race!

Forward lean while running is a product of shifting the center of mass through acceleration. A runner is generally able to accelerate at full effort for about six seconds. At that point, acquired speed and the decreased efficiency of muscular contractions stop the runner from accelerating further. From that point on, gradual deceleration occurs.

APPLYING BIOMECHANICS TO THE JUMPING EVENTS

As stated earlier, it is crucial for the coach to understand that once in the air, a jumper's center of mass follows a predetermined parabolic curve. No action by the jumper in the air will affect the path of his or her center of mass. The length or height of the jump, however, can be improved by adjusting the body's position relative to the center of mass.

The law of action-reaction dictates that arm and knee drive will increase reaction off the ground. Arm and leg thrust creates a reaction of force to the ground that causes a second reaction of force upward from the ground through the body.

In the long jump and triple jump, horizontal velocity, the takeoff angle and landing efficiency are the primary determinants of performance, with horizontal velocity by far the most influential. Horizontal velocity combined with the optimum angle of flight dictates an approximate takeoff angle of 25-degrees in the long jump and even less in the triple jump. The proper takeoff angle is achieved through an efficient application of vertical velocity to the acquired horizontal velocity. Once in flight, technique works to counteract forward rotation in the jump. A landing technique with the head and chest dropped forward and hands thrust back will optimize the body's position with the legs above and forward of the center of mass.

The primary components of performance in the high jump are vertical velocity, angle of takeoff, use of forward (or centrifugal) rotation and bar clearance efficiency. With proper clearance technique it is actually possible for a jumper to jump very near the height of the path of his or her center of mass.

Biomechanically, the pole vault combines aspects of both the horizontal and vertical jumps. The vault requires great horizontal velocity that is stored into the pole and then transferred into vertical velocity. As with the high jump, it is possible for the vaulter to vault above the path of his or her center of mass once he or she releases the pole.

APPLYING BIOMECHANICS TO THE THROWING EVENTS

The most influential factor in throwing performance is the speed of release of the implement. Horizontal velocity (both linear and rotational) combines with vertical velocity generated by arm and leg thrust to determine the flight path of the implement.

In the throws, the aim is to accelerate the implement over the longest distance possible, thereby resulting in the greatest attainable speed at release. This is why discus throwers keep the discus extended from their bodies during their turns. Acceleration of the implement is also achieved through angular velocity. The torque of the body and the decrease in angular momentum through the pulling of the free arm both accelerate the implement to its point of release.

The optimum angle of release in the shot put is approximately 42-degrees. The optimum angle of release decreases as the height of release increases. A one inch gain in release height can lead to an increased distance of nine to 15 inches. For this reason, taller throwers are clearly at an advantage biomechanically. In the discus, the angle of release is lower because of the aerodynamic characteristics of the implement. Thirty-four to 40-degrees seems to be the optimum angle of release.

Universal Principles of Training

In addition to having a basic understanding of track and field biomechanics, a coach must also understand and apply the fundamental principles that govern any type of physical training. These principles derive from the human body's response to training, stress and skill acquisition. Not comprehending these basic tenents produces misinformed training and exposes athletes to the risk of injury. The following principles must be followed in any well-constructed athletic training program:

OVERLOAD

The most important principle of training for athletics is that of **overload**. It should be the aim of coaches to improve their athletes' levels of performance and the capacity for work. In order to achieve this goal, a coach must cause his or her athletes to adapt to a higher level of physical and mental performance. Overloading is the essential mechanism, or tool, for creating this adaptation.

Any new type of training subjects the body to greater or different stress than that to which is has become accustomed. When the load is greater than the normal level of exertion, that load becomes a **stressor** and stimulates a general adaptation process within the organism (the athlete).

This process is explained in Hans Selye's concept of the **general adaptation** syndrome, which states that all organisms respond uniformly to stress. When confronted with a stressor, an organism will initially respond with alarm. As the stress continues, the organism will then resist in various ways. If the resistance is positive, the organism is said to have adapted. If, however, the resistance to the stress is negative or the stress is unchecked, the organism will degrade into a state of exhaustion.

Selye's Theory of General Adaptation

Stress

Stage 1: Alarm

Stage 2: Resistance Stage

Stage 3: Positive Adaptation or Negative Exhaustion

The general adaptation process causes the body to react in a predictable manner to stress. This predictability allows coaches to plan positive adaptation to overload by their athletes. Conversely, this process also explains the negative results that athletes experience when overload or stress is managed improperly.

PROGRESSION AND VARIABILITY

The logical consequence of adaptation to overload is **progression**. As an athlete adapts to a given training load, a progressive increase in load then becomes necessary to continue the process of adaptation to the next level of performance. In other words, as the system is capable of doing more, it requires progressive increases in training load for it to be stressed into a higher level of adaptation.

For progress to be achieved, however, an accurate assessment of an athlete's capacity for training must be made. Athletes should be pre-tested and then periodically reassessed in terms of the physical requirements and skills demanded by their respective event(s). Some common measures of such testing are VO_2 max, muscular strength, muscular endurance, vertical jumping ability and flexibility. Such information becomes the foundation upon which a coach manages the progressive overload that improves his or her athletes. Without such knowledge, training becomes haphazard and often results in the frustration or injury of the athlete.

There are four important measures of progressive overload: mode, frequency, intensity and duration. **Mode** is the type of training undertaken (e.g., running, jumping, or weightlifting). **Frequency** is the number of training units in a given time frame (i.e., weight training three times per week). **Intensity** is a measure of the degree of exertion in training (e.g., 6x100m @ 80%). In running, training intensity is commonly measured by time per distance run. **Duration** is the length of time or number or repetitions of a particular training mode (e.g., 45-minute steady-state run or performing 10 short approach jumps). Manipulating these four parameters of training is the essence of the coach's role in directing the training of his or her athletes.

A corollary to the principle of progression is **variability**. Varying the type of training done by the athlete spurs the adaptation. Any single type of training yields good improvement for a period of roughly four weeks. Beyond that amount of time, results diminish. Remember that one of the measures of overload is training mode; varying the type of training done works to fulfill this basic principle.

SPECIFICITY

Our bodies adapt to exercise or physical stress in direct response to the nature of the demands imposed. This phenomenon is known as the **specific adaptation to imposed demands (SAID)**; therefore, training needs to address the specific requirements of an event. An athlete must train the skill or system that will be employed in competition. Distance runners must train to raise aerobic thresholds; jumpers must train for rhythm and explosiveness; 400m runners must train for lactate tolerance. Moreover, athletes need to train physically and mentally for competition, not merely conditioning. A certain amount of training must mimic the specific nature of the competitive event. To achieve success, the coach must identify and heed the requirements of particular events.

RECOVERY AND RESTORATION

All gains in training are achieved during periods of recovery. This fundamental fact of athletics is probably the most ignored. Recovery and restoration of the body are integral and active elements of training, not the absence of training. For the body to adapt positively to the progressive overload of training, it must be able to recover adequately from the applied stress. The mantra “no pain, no gain” all too often runs the very thin line between maximum beneficial training and overtraining. The volume of training is far less important than its intensity and intelligent application. Training without proper rest yields poor results and, often, injury.

Too frequently, coaches do not understand the physiological response generated by hard training. Generally, adequate recovery from a strenuous workout requires at least 48 hours. In any given week, no more than two or three intense training days are recommended. Moreover, days of total or active rest are needed to relieve the accumulated fatigue of exercise. Without such recovery, chronic overtraining with significant risk of injury becomes likely. Coaches often view rest as wasted time in which they might be able to squeeze more preparation. This commonly seems to be the case near the end of season when they should be doing just the opposite. Rest should be greatest during the championship phase of any season.

INDIVIDUALITY

Every athlete has a different response to and capacity for training. Recognizing individual differences and adjusting expectations when designing and applying training programs for our athletes is exceedingly important. Size, age, strength, training age and even emotional maturity factor into the type and amount of training under which any athlete will thrive. At the high school level, especially, coaches often will find that many of their most talented athletes have a limited capacity to train hard, while less talented athletes can endure much more. While the overall design of a training program will most likely apply to all, volume and intensity must be specific to the individual.

Planned Performance Training

The primary purpose of training is to improve and plan the performance of the athlete. The systematic application of skill instruction, biomechanics, and the principles of training to the development of track and field athletes is **planned performance training**.

Planned performance training seeks to achieve maximum improvement in performance and is structured so that peak performance occurs at predetermined moments within the competitive season. That, after all, is the point of competition. Without such planning, the training of the athletes becomes haphazard and good results become a matter of happenstance rather than planning and prediction.

The first requirement of successful planned training is **assessment**. A coach must evaluate the athletes and their abilities, the level of competition and the time available for training and competition. From this evaluation, the objectives and goals for individuals and the team are defined. A set of expectations for the athletes establishes direction and purpose for their efforts. Expectations frame the goals the coach and the athletes will have for the season. At the same time, though, goals must be realistic and open ended. Goals that are too grandiose only serve to discourage performance. Goals that do not evolve inhibit the unseen abilities of the athlete. Goals are most often achieved when accompanied by the true expectation of success.

The second element of planned performance training is **planning**. The coach needs to create an overall plan for training the team and individuals. This plan should apply the fundamental principles of training to the expectations and goals that have been defined. If anything, this basic plan constitutes the foundation upon which the coach creates the structure of competitive success. Coaching without a plan for the season or phase of training is like navigating unfamiliar territory without a map.

Too often athletes are kept ignorant of the course of their training. How can they possibly prepare mentally to train with commitment if their coaches do not demonstrate such preparation? Of course, training must be adapted to circumstance, but without a strategy athletes are unlikely to experience success.

Once a plan is made, the **construction and execution of the daily, weekly, and cyclic training components** becomes the third element of planned performance training. This constitutes the body of the training design.

The fourth step in the process of planned performance training is evaluation. **Evaluation** is not a final step, but an ongoing process that allows the coach's strategy to adapt to the changing demands of any training situation. Evaluation provides measurement and feedback that allows the coach and athlete to evolve over the course of the season.

PERIODIZATION

The integration of these four components of planned performance training with the fundamental principles of training results in the periodization of the training process. *Periodization is the key to planned performance.* It is the division of training into distinct units that emphasize different methods and types of training. The aim of periodization is to maximize the physical progress of the athletes and prepare them for a concentrated period of peak competitive activity. Good periodization of training results in good performances on the track or in the field. Devising a functioning plan that varies the mode, volume and intensity of work in accordance with the time available for training and competition enables positive progress to be the rule rather than the exception.

While the concept of periodization may seem complex, it can be explained by a simple metaphor; periodization is the *recipe* of training. This recipe controls the amount of overload, its progression and variation, the specific ingredients involved, individual tastes or differences, and the rest or settling required to produce the *well-cooked* athlete rather than one who is *under-prepared, overcooked* or too often *burned*.

Types of Training

The dilemma for every coach when periodizing training is integrating the many types of work to be done according to sound training principles in a timely and effective manner. In doing so, dividing both the work and time into manageable units is helpful. In track and field, the types of work can be divided into five basic categories: running, strength and agility training, technique, drills and warm-up/flexibility training. With the exception of warm-up/flexibility, the nature of the exercise, volume and intensity all vary substantially throughout the course of the training year.

Running composes the bulk of most track and field training. For that reason coaches must pay special attention to the volume and intensity of this training mode.

Strength and agility training focus on the overall development of physical capacity and coordination skills. For the high school coach, this is an important and delicate component of training.

Technique development concentrates on the development of the whole action of a given event.

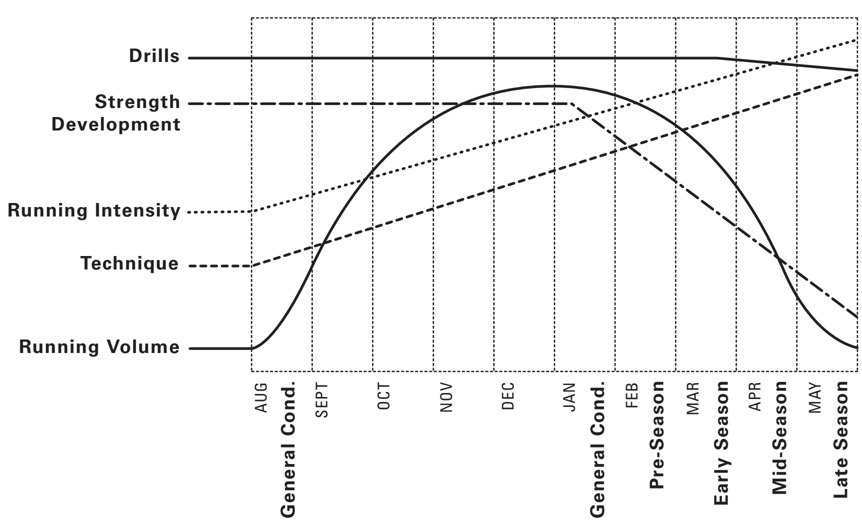
Drills are a subdivision of technique development. Drills develop and reinforce individual elements of a particular technique.

Warm-up/warm-down/mobility/flexibility are those portions of training that help athletes prepare for strenuous activity and help them recover properly after the activity.

Dividing the Training Year

In terms of time, the training year can be divided into units that are known as cycles, phases, or periods. The concept of a training cycle is common language in discussing periodization. For example, a coach might consider one training year as a macro-cycle. For the high school coach who rarely has the opportunity to train athletes year-round, however, the year could be divided into two mega-cycles. Within these larger cycles, microcycles approximately a month long would become the basic unit time over which to construct a training plan.

PERIODIZATION OF YEARLY TRAINING



By breaking down both work and time into these manageable units, a coach can then construct a general periodization scheme for the training year. (See chart.) By applying the principles of training to these time and work components, the degree of emphasis (volume and intensity) for any type of training throughout the year is determined. Of course, the art of coaching lies in adjusting such a general outline to fit individual and team circumstances.

SYSTEMATIC TRAINING

Training for planned performance requires a coach to integrate several types of training. These types of training can be divided into three categories:

- General training
- Specific training
- Specialized training

General training develops the overall physical capacity and fitness of the athlete. This encompasses basic running, weight training, plyometric exercise and rhythm development.

Specific training has a direct correlation to the skills necessary for a given event. Often it is a refinement of general training. Running and jumping technique drills, specific plyometric drills, hurdling and block starts are examples of specific training.

Specialized training duplicates the exact movements and conditions of an event. This normally involves exercises that replicate a specific feature or phase of the event. Full jumps, time trials, strict throws and full hurdle flights are examples of specialized training.

For several reasons, the vast majority of training for high school athletes should be general in nature. Young athletes will benefit more from general training throughout most of the season. Coaches should focus on developing athletes first, then event specialists. Also, with a large number of athletes to guide, few coaches can spend the time necessary for intensive specialized training. Finally, many athletes compete in multiple events. General training fulfills other event demands as well as those of the athlete's specialty.

Specific training, on the other hand, teaches an athlete a particular event. The proportion of specific training should increase over the course of the season.

Specialized training is the refinement of learned technique. At the high school level, it should account for a modest proportion of the total training regimen.

A system of training uses several methods and types of training within a seasonal training cycle. The chart on this page outlines a recommended training plan.

	WEEKS	PRIMARY EMPHASIS	SECONDARY EMPHASIS	MAINTENANCE
Pre-Seasaon	2	General Training	Specific Training	
	3	General Training	Specific Training	General Training
Early Season	3	Specific Training	Spec./Gen. Training	General Training
	3	Specific Training	Spec./Gen. Training	General Training
Mid-Season	2	Specific Training	Specific Training	General Training
	2	Specific Training	Specific Training	Specific Training
Late Season	2-4	Specific Training	Specific Training	General Training

PLANNED PERFORMANCE BEYOND THE SEASON

The periodization of athletes' training should not stop at the end of their high school season. Some athletes may be willing and able to train in the off-season. Many will participate in other sports. Off-season training should focus on general fitness and skill development.

It is best for athletes to follow their competitive season with several weeks of active rest. Then, they can begin to gradually work back into a high level of general fitness. When good physical fitness is attained, a period of hard general training should take place.

Another rest period should follow to facilitate recovery before the next track and field season begins. Event specific training should encompass approximately 20 percent of the off-season training load.

The overall career of high school athletes should be planned as well. Preparing a four year plan for a freshman athlete gives the coach and the athlete a set of goals and a course of development to follow. It also motivates the athlete, especially one whose initial skills or maturity are undeveloped. Such a plan will enable athletes to imagine the athlete they can become in the future. Once an athlete sees the long range plan, he or she might be willing to sacrifice some immediate success for the benefit of his or her greater performance in later years.

Integrating Skill and Fitness Training

A general rule of coaching is that when an athlete trains for technique he or she doesn’t emphasize fitness, and when an athlete trains for fitness he or she doesn't emphasize technique.

In other words, when training athletes for technique, begin by emphasizing correct execution, not speed of execution, and allow for sufficient recovery between each trial or repetition. In coaching technical events (in particular the jumps, throws and hurdles) there is a tendency to spend most of the training time on improving skills; however, an athlete’s level of fitness severely limits the amount of technique training he or she can accomplish before succumbing to fatigue, so every event must incorporate endurance, strength and stamina training.

All track and field athletes need to do some aerobic running to enhance both their capacity to train and their ability to recover from training. All runners and jumpers need to do some repetition training to enhance their running economy, and all runners need to do some high-lactate training (in the form of hills and interval training) to enhance their lactate tolerance and anaerobic thresholds.

SUMMARY

- Do skill training (drills) before you do fitness training in your daily workout plan.
- In early season use a 60:40 ratio of conditioning to skill training.
- In midseason use a 40:60 ratio of conditioning to skill training.
- In late season use a 20:80 ratio of conditioning to skill training.

Warm-Up, Warm-Down and Stretching

The purpose of a warm-up is to prepare an athlete physically and mentally for a training session or competition. Stretching is of little use if it is not done correctly.

Stretching should always be preceded by a 5-15-minute period of jogging or aerobic exercise to allow muscles to gradually loosen and their core temperature to rise above 102-degrees.

A tight muscle is a ready target for a muscle pull or strain. Athletes should be perspiring freely after their warm-up *before* they begin to stretch. Wearing a warm-up suit will help accelerate the process of warming-up and prevent athletes from cooling off again while they stretch.

A running warm-up should begin with easy jogging for several minutes, then gradually increase in tempo and include some bursts of slightly faster running called **surges**. Athletes will quickly become bored doing the same warm-up routine each day, so coaches should consider using a somewhat different running warm-up prior to each training session.

RUNNING WARM-UP EXAMPLES:

- 2000 meters (5 laps), surging the last 200m of laps 3 and 5
- 2400 meters (6 laps), surging the last 100m of laps 2, 4 and 6
- 2800 meters (7 laps), surging the last 50m of the last 5 laps

A proper warm-up for one athlete may be completely different than a proper warm-up for another athlete, even if both athletes are training for the same event. Coaches should have athletes try various longer and shorter warm-ups in preseason to determine what works best for each individual athlete.

ORGANIZING PRE-TRAINING WARM-UP

Young athletes must be constantly reminded that a complete workout includes a warm-up run, stretching, acceleration sprints and a warm-down to ensure a quality performance and reduce risk of injury. Coaches cannot expect high school athletes to warm-up vigorously with precision, en masse, on their own without adult supervision! The coach must *lead* some things that can be completed every day to be done as a team to *be* a team.

The warm-up is the one part of the training session that athletes in all seven event areas can do together. Since a team has limited daily practice time, coaches cannot afford to spend more than 30 minutes having their athletes warm-up. Only under the direct supervision of the the coach will the warm-up be a well-executed, quick-paced prelude to the focus of the training session.

STRETCHING EXERCISES

After athletes are warmed up, they can begin to stretch. A stretching routine should include exercises to develop balance, flexibility and mobility. **Balance** refers to the equal function of the muscles which work in opposition to each other (e.g., the quadriceps muscles on the top of the thigh and the hamstring muscles on the back of the thigh). **Flexibility** refers to the elasticity of muscles. **Mobility** refers to range-of-motion.

An effective way to motivate athletes to stretch is to convince them that stretching will make them better athletes! Stretching gives a muscle greater elasticity, which enables it to lengthen into a longer muscle and contract into a smaller muscle, which in turn makes it stronger. A loose muscle is also able to relax more completely between contractions, which enables it to be more explosive or powerful. And long muscles enable the body's levers to move and apply force through a wider range-of-motion.

To develop balance, an athlete must employ exercises that stretch the major muscle groups on both the front and back of the limbs and torso. To develop flexibility, an athlete must emphasize slow, controlled stretching called **static stretching** (as opposed to bouncing, *ballistic* stretches). Each stretch should be sustained for a minimum of 10-30 seconds. Anything less does not allow the muscle time to relax and achieve a full stretch. Each exercise should be performed until a slight stretching of the muscle can be felt and then released. Each repeat of the stretch should allow a little more movement than the previous attempt. The proper way to breathe is to exhale slowly as the stretch is performed.

To develop mobility an athlete must do exercises which move the legs and arms through a wide range of motion. Here is a recommended sequence of stretches.

FLEXIBILITY STRETCHES

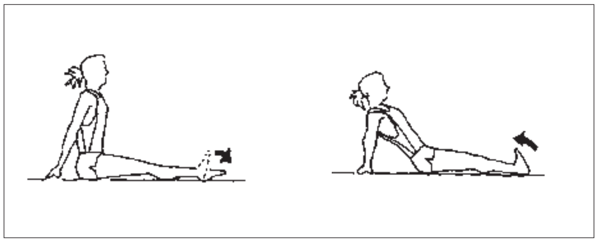


Fig. 3-1. Toe Pointers.

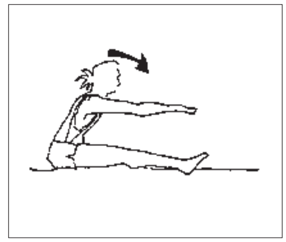


Fig. 3-2. Butterfly Arms-to-Toes.

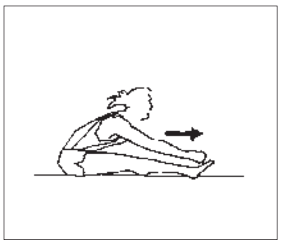


Fig. 3-3. Reach Over.

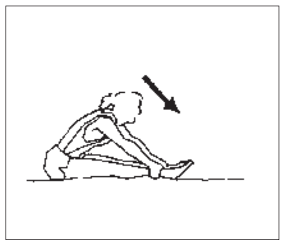


Fig. 3-4. Pull Forehead-to-Knees.

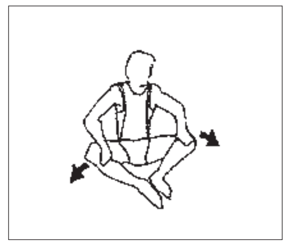


Fig. 3-5. Yoga Sit.

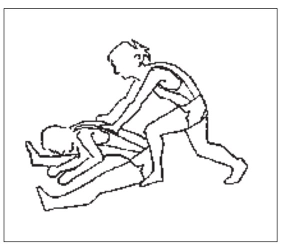


Fig. 3-6. V-Stretch.

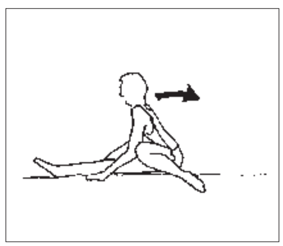


Fig. 3-7. Hurdler's Stretch/Lay Back.

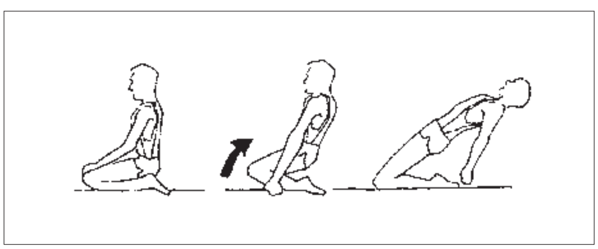


Fig. 3-8. Sit-on-Heels/Hip Bridge/Lay Back.

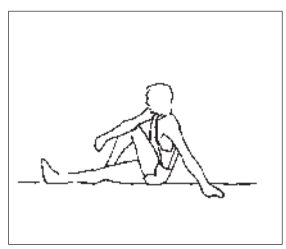


Fig. 3-9. Figure "4".

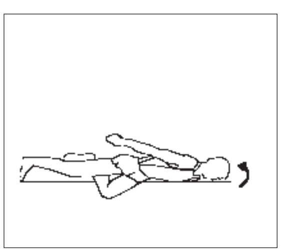


Fig. 3-10. Sciatic Stretch.

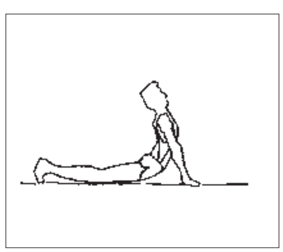


Fig. 3-11. Abdominal Stretch.

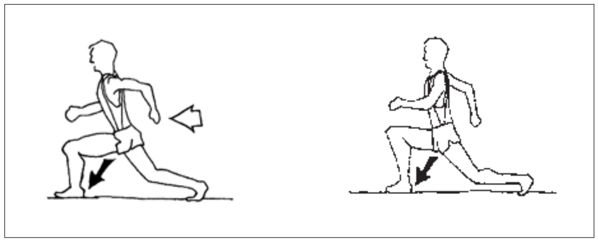


Fig. 3-12. Hip Flexor.

MOBILITY STRETCHES

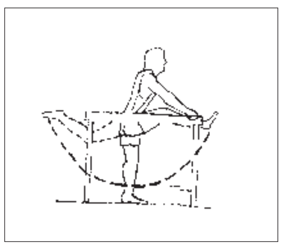


Fig. 3-13. Forward-and-Back Swings.

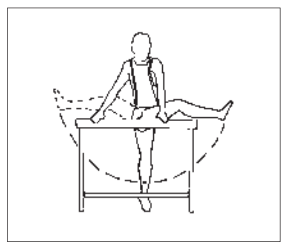


Fig. 3-14. Side Swings.

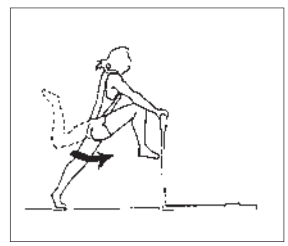


Fig. 3-15. "C" Swings.

SIMPLE RHYTHM DRILLS

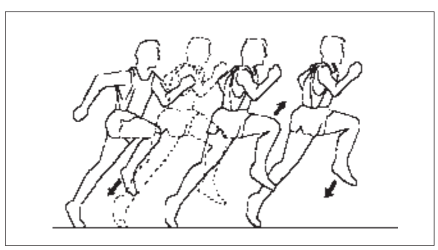


Fig. 3-16. High Knees.

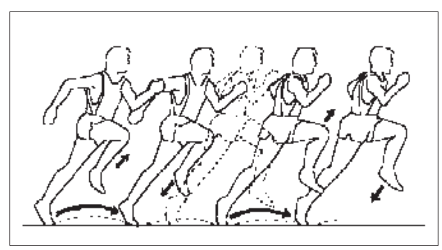


Fig. 3-17. High Skipping.

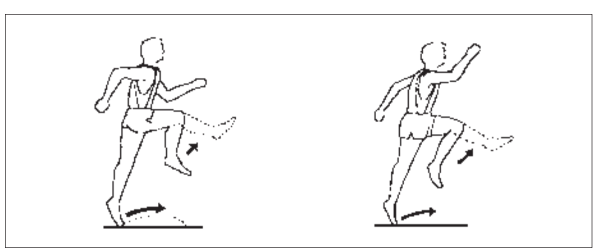


Fig. 3-18. Skipping Kicks.

WARMING DOWN

It is imperative that an athlete conclude each training session with a warm-down period. The consequences of not warming down after intense exercise include severely stiff and painfully sore muscles the next day – this is a result of the body's cooling rapidly after training allowing lactic acid to pool in the muscles overnight.

The purpose of a warm-down is to allow the body to gradually reduce its temperature and respiration rate to normal. Slow jogging and walking for five to 10 minutes allows the heart rate to decrease gradually and the muscles to disperse most of the lactic acid that has accumulated during the workout. If the training session has been especially intense, stretching after a warm-down jog is the best way to prevent the muscle soreness that may result the next day. The same series of stretches used for the warm-up can be used during the warm-down.

WARM-UP SCRIPT

1 RUNNING WARM-UP

2 FLEXIBILITY STRETCHES

Sitting on the ground, legs extended with shoes off:

- Toe pointers (fig. 3-1)
- Butterfly -arms-to-toes (fig. 3-2)
- Reach over-toes/insteps/outsides Of feet (fig. 3-3)
- Pull forehead-to-knees (fig. 3-4)
- Yoga sit (fig. 3-5)
- V-stretch (fig. 3-6)
- Hurdler's stretch/lay back (fig. 3-7)
- Sit-on-heels/hip bridge/lay back (fig. 3-8)
- figure "4" (fig. 3-9
- Sciatic stretch (fig. 3-10
- Abdominal stretch (fig. 3-11)
- Hip flexor (fig. 3-12)

3 MOBILITY STRETCHES

Standing, holding onto a stationary object and swinging the outside leg up toward hip level:

- Forward-and-back swings (fig. 3-13)
- Side swings (fig. 3-14)
- "C" swings (fig. 3-15)

4 RHYTHM DRILLS

- Easy swing skipping
- Fast swing skipping
- High skipping (fig. 3-17)
- Skipping kicks (fig. 3-18)
- skipping with quick footstrike
- jogging butt kicks
- High knees (fig. 3-16)
- Fast hands/quick feet

CHAPTER 4

Strength and Power Training

Strength and power are qualities that optimize athletic performance and prevent injuries. Although not all athletes require or can handle intensive weight lifting, all track and field athletes should engage in some type of strength training. For high school athletes, strength training should first concentrate on the development of basic fitness and injury prevention. Only when these goals have been accomplished should strength and power training be implemented to focus on improving competitive performance.

Strength Training

Strength training is an integral component of track and field. Such training clearly improves the basic strength, power, speed and general fitness of athletes. It also aids in the prevention and rehabilitations of injuries when it is done properly. A philosophy of strength training for high school track and field athletes must be based on these fundamentals. In other words, the first goal of all training must be to improve the health and fitness of young athletes. The second goal should be to improve competitive performance.

Strength and weight training for high school track and field teams present unique challenges. Weight training programs must account for a large number of athletes, a limited number of coaches to supervise, and athletes of vastly different strength, maturity, and needs based on their event specialties. In light of this, coaches must construct their programs with an eye to safety, individuality and recovery. That is to say, coaches must make sure any strength training is done safely and is appropriate for the individual athlete. In fact, the best program for a team may not address every specific event requirement. Strength training for high school athletes is most productive when it focuses on the development of general physical strength and fitness.

The aim of this chapter is to provide a strength training program of practical value for the high school track and field program. It is not intended to be a definitive treatment of strength or weight training. The program that is suggested here should work well for all track and field athletes.

Strength Training Principles

The universal principles of training discussed in the previous chapter must guide any strength training program if it is to be successful.

- Progressive overload
- Specificity
- Recovery
- Variability
- Individuality

Progressive overload, or progressive resistance, is the cornerstone of strength training. Gradual increases in the amount of repetitions completed or weight lifted stress the body to adapt to higher levels of strength. In general, progressive increases are the measure of increased strength.

Strength training also needs to be *specific* to the demands of track and field and its individual events. As a consequence, strength training for track and field should be aimed at increasing the overall strength, and especially, the power of the athlete.

All gains are made during periods of *recovery*. Without adequate rest between workouts, the strength of the athletes will actually decrease. The process of super-compensation that produces increased strength occurs while the athlete is recovering, not while the athlete is training.

The neuromuscular system makes its greatest changes in response to an unaccustomed **stimulus**, or shock. This requires strength training incorporate a relatively large amount of **variability**. Research has shown frequent variations in volume, intensity and mode of strength training produce the greatest gains in strength.

POINT OF EMPHASIS!
At no time is there a greater range in the individual physical characteristics of similarly aged individuals than during high school. Strength training programs must adapt to the different capacities of individual athletes. Sometimes the difference between the most and least mature athletes will literally be the difference between an adult and a child. Failing to construct a strength training program accordingly will lead to the frustration or injury of athletes.

In addition to the general principles of training that govern strength training, ***there are principles specific to weight training that must be understood:***

- Endurance should be developed primarily on the track. The weight room is for strength and power development.
- Proper posture, biomechanics and technique enhance both track and field performance and weightlifting.
- When athletes are first learning to weight train, coaches should emphasize that repetition of movement creates rhythm and develops better technique. After technique and rhythm are mastered, variation of the exercises keeps athletes physically and psychologically fresh.
- **Event specificity.** One of the recent areas of development in weight training is the concept of movement specificity. This, in effect, says a portion of weight training

should resemble or target the specific movements of an athlete's event; however, the primary goal is still to develop the general physical capacities of performance first, and specific ones second.

In weight training, there are simple single-joint movements and more complex multi-joint movements. The single joint movements are not technically challenging. These include curls, leg extensions, seated presses, supine presses, etc. More complex multi-joint exercises are power cleans, snatches, lunges, squats, etc. The multi-joint exercises are a mix of power and balance. Throwers, jumpers and sprinters who emphasize multi-joint movements and do little or no event specific training in the weight room will still make significant improvement in their individual events.

Using weighted vests or other paraphernalia for event specific exercise must be done cautiously. Rhythm, speed of movement and technique are altered by unnatural added weight. For a high school athlete with limited workout time, the development of good competitive rhythm is very important. Too much emphasis on resisted movement hinders the learning of such rhythm and technique.

Plyometric training should never be done with added weight; gravity and speed should be the sources of overload.

- An athlete has a finite amount of training energy each day. The key to successful strength training for track and field athletes is the careful integration of that training energy and available time into the overall training program. Strength and power training are important because they increase the basic physical capacity of the athlete; however, track and field athletes are not weightlifters; they are runners, jumpers and throwers. Weight training, running, plyometrics, jumping, throwing, studying, work and social activities cannot all be done successfully in the same day! Coaches should be very aware of their athletes' total workload.

- Proper nutrition is vital for track and field athletes. Extreme workloads require hypernutrition and proper timing of food intake. Athletes should eat healthy snacks even during training sessions. It is best to have several small meals daily rather than one large meal for food to be utilized optimally.

  Good nutrition is essential to realizing gains made from strength training. The caloric intake for a thrower will often be much greater than that of a sprinter or jumper. The key measure of weight training progress is the strength-power/weight ratio.

  In general, throwers are heavier than jumpers. Coaches should keep a close eye on any weight gain by sprinters, hurdlers, or jumpers. If a sprinter is suddenly

10 pounds heavier and only 2% stronger, chances are that sprinter's performance will not improve on the track. A potential side effect of proper weight training and nutrition might be a couple of pounds drop in weight with a 5% increase in strength. This usually results in a significant improvement on the track or in the field. Knowledgeable coaches can use skin-fold calipers or hydrostatic weighing to determine body fat percentages.This takes the guesswork out of the process; however, a coach can usually see the results of strength training in the physique of the athletes by simply being observant.

General Guidelines of Weightlifting Sets and Repetitions

- With machines, light sets of 10–15 repetitions strengthen joint stability, and moderate sets of 5–10 repetitions help develop musclar gains. With free weights, light to moderate load sets of 6–10 repetitions develop lifting technique and harmony between the muscle groups; heavy sets of 2–6 repetitions develop general strength and power.
- Generalized strength training with a small number of event specific exercises can produce significant results. A large proportion of event specific strength training should be done only by advanced athletes under the supervision of knowledgeable coaches.

Weightlifting programming is not as complicated as some coaches make it out to be. Following or developing a basic progressive overload system will provide athletes with a significant advantage; however, if athletes are not yet capable of modeling basic proficiency in their chosen events, time in the weight room will not help them achieve technical proficiency in their event. A young athlete's time is most often better spent learning the basic techniques of an event rather than spending additional time in the weight room. As a general rule, the more advanced/skilled the athlete, the more important weightlifting becomes as part of his or her training regimen.

Safety in the Weight Room

If proper care is not exercised, the weight room has the potential to become a dangerous area for athletes.

The coach has four primary responsibilities to ensure the safety of the athletes. The first is to evaluate the physical condition of the athlete. The second is to properly maintain the equipment. The third is to ensure proper lifting and exercise technique are follwed. The fourth is to guarantee proper assistance or "spotting" for every lifter.

Physical Condition of the Athlete

Weight training, particularly with free weights, requires the coach to evaluate the physical condition of the athlete prior to beginning any weight training program. At the high school level, especially, coaches are faced with extreme differences in the physical development of the athletes. This also includes, of course, the differences between male and female athletes. A set of evaluative physical tests and a careful developmental strength program are prerequisites to a safe and effective weight training program. Such testing should not only be done prior to beginning any weight training but also periodically throughout the training cycle. Weight training does incur some degree of physical risk. Coaches must carefully supervise the physical and technical development of their athletes. If it is determined there are athletes who are not yet ready for the weight room, those athletes should maintain a strength training program with bodyweight exercises (e.g. lunges, incline push-ups, assisted pull-ups, bodyweight squats and core work) that will prepare them to eventually move to a weightlifting program.

Condition of the Equipment

The risk of severe injury appears when equipment is not maintained or becomes damaged. The coach in charge of the weight training facility should regularly check cables on machines for wear and tear. The coach should also check the condition of seat backs on leg press machines, stability of benches, condition of power racks, positioning of free weight storage racks, condition of bars and dumbbells and the fit of the bar collars. A clean, stable lifting surface should be used since many major injuries occur when athletes slip on the lifting surface. Each coach should also make sure that proper shoes are worn and lifting belts are used. Those athletes who perform heavier lifts should not do so in running shoes; basketball, wrestling or special weightlifting shoes are needed to provide stability. No one should be allowed into the weight room without proper footwear. No sandals or open toed shoes should be allowed in a weightlifting environment, even if the athlete is just sitting and watching.

Proper Weightlifting Technique

Proper technique produces better results and reduces the risk of injury to the athlete. Even when working on machines, there is a risk of injury if leverage is not applied properly. When handling free weights, the consistent use of sound technique is essential, even with light weights.

The best way to make sure athletes are able to perform exercises properly is to teach the basic movements using only a bar without any additional weights. Some exercises such as the Olympic lifts are best introduced to athletes by having them learn proper technique using a broom stick or a section of PVC pipe. The coach has a responsibility to mandate technical proficiency before allowing athletes to move to heavier weights.

To diffuse the teenage bravado commonly seen in high school weight rooms, it is critical the coach sets an environment where everyone "checks their ego at the door and learns to so things correctly." Reward effort that is put towards technique and make sure the athletes know that a properly executed 200lb. full squat is much more impressive than a 500lb. quarter squat.

Only with proper technique can real strength gains be made.

Proper Assistance, or Spotting

Spotting is commonly used in free weight exercises such as squatting and bench pressing. As lifts get heavier, more spotters are required to maximize safety. This helps create a total lifting environment for the athletes – one that demands the awareness of others' safety at all times.

Bench Press. A minimum of one person stands behind the athlete to make sure the lifter safely completes the lift. The spotter should use a solid grip to help guide the bar back to the bench in case of problems. The spotter should not allow the lifter to struggle if the bar starts to tilt to one side during the lift (this can cause rotator cuff or pectoral tears) or if he sees extreme arching of the back (this can cause lower back injury).

For very heavy lifts, a triple spot is recommended. This includes two side spotters to aid the spotter in the back. It is important the side spotters follow the lead of the back spotter and all three spotters guide the bar back evenly. Injuries can happen when a side spotter panics and lifts too aggressively, tilting the bar to one side; equally, a side spotter who fails to lift the bar when ordered may also cause the bar to tilt.

Squats should be performed safely inside a squat rack with pins that trap the bar in case of a failed lift. If the lift is performed outside the rack, spotters are mandated.

On light to medium lifts, one spotter is needed. The spotter stands directly behind the lifter, ready to help in case of failure. The spotter stands with knees slightly flexed and arms near the lifter's torso. If the lifter fails to rise, the spotter steps in, hooks both arms around the torso, and pulls up. This stabilizes and assists in the lift. One style of spotting involves reaching around the torso and placing the palms of both hands on the lifter's pectorals. Another is to place both hands around the sides of the torso, just above the weight belt, and lift upward. The first method, which is the strongest and most efficient, is recommended.

For heavy lifts, three spotters are recommended. As with the bench, the side spotters must synchronize with the back spotter for proper balance. For every lift, the lifter must maintain consistent effort throughout. With heavy lifts, spotters alone will not prevent a crash of the weight. *The lifter must continue to push through until the weight is racked!* This is something that must not only be taught prior to any lifting but also practiced at lighter weights by both the lifter and the spotters.

Spotters must be extremely vigilant since, if injury occurs or a lifter passes out, the weight may be entirely in their hands! For this reason, spotting a 300-pound bench press or a 500-pound squat can be very hazardous and must be approached with great attention and caution.

Another very important point in weight room safety is the use of well-fitting bar collars. The collars, if used properly, will keep the weights from slipping off the bar. Another crucial safety measure is checking the weight on the bar. It is easy to forget to add a plate or remove a plate from one side of the bar. The resulting imbalance can cause serious injury.

A Note on Squatting Failure with Heavy Weight

Most athletes when squatting will eventually encounter a weight they cannot manage. In these instances it is imperative the athlete know it is OK to drop the bar to the floor. It is much safer to bail out of the lift and have the weights crash than to allow the weight to compress the athlete or allow the spotter(s) to push the lifter out of alignment in a rescue. A bent bar or loud noise is preferable to serious injury.

In the case of low repetition squatting with very heavy weight (over 350lbs) a spotter on the athlete's back will do more harm than good. Two side spotters are necessary and their sole job is to remove the weight from the lifter if the bar stops traveling upwards. If the bar stalls, they take all the weight off the squatter. Do not allow a squatter to "push through" a stalled squat. Spotters during a maximal squat effort are an “all or nothing” proposition. A spotter on the back of the lifter will be unable to lift enough of the weight to be of any help and will only serve to push the squatter out of proper lifting position.

Olympic Lifts Safety

Olympic lifts regularly demand weights be dropped to the floor and are, therefore, only to be attempted in weight rooms with appropriate bumper plates and lifting platforms. Olympic lifting should only be done on a solid, level platform. The lifting platform must be clear of all observers and teammates during the lifting attempts. When dropping the weight, the bar should be “pushed” (the lifter’s hands follow the bar to the ground while exerting mild downward pressure) and not allowed to bounce wildly. The athlete should not attempt to slow or resist the bar’s descent or try to “catch” a bouncing bar.

The use of lifting chalk (magnesium carbonate) is encouraged for the Olympic lifts in order to help the athletes grip the bar.

There is no spotting in the Olympic lifts or their derivatives. When properly taught, the Olympic lifts and their derivatives are among the safest exercises athletes will do.

Medical Clearance. All athletes should be examined and cleared by a doctor before undertaking a weight training program. Those with high blood pressure, congenital back problems (bulged discs, loose ligaments), knee problems, etc., should not be allowed to lift until those problems have been addressed.

The Strength and Weight Training Program

The following section offers a strength training program designed for track and field athletes. The program is divided into three levels, each intended for athletes of various maturity, strength and event specialties.

A team's actual program will be defined further by the following factors specific to a school's situation:

- Equipment
- Weight training knowledge
- Time availability

- Number of athletes
- Staff available for supervision
- Type of athlete
- Event specialties of your athletes

The following levels outline strength training programs that range from a most basic weight training program to an advanced training system.

LEVEL I

The Level I routine is a basic strength training circuit which targets athletes that have little or no weight training experience or those who may be physically weak or immature. Most distance runners would follow this type of program.

Advanced athletes may also use this type of program as a transition from off-season to preseason training or if they are returning to strength training following an injury.

Preseason training should include three sessions weekly. During the competitive season, young athletes competing in the throws may strength train three times per week: however, athletes participating in the other track and field events should cut back to two sessions.

Strength training for distance runners is strongly recommended but must be kept in perspective. First, coaches must remember the concept of specificity. The basis of success in the distances is aerobic fitness. Since weight training primarily develops strength and power, it applies less specifically to distance running than to other track and field events. Certainly, strength training will help distance runners, but its goals should be to develop overall fitness and prevent injuries that result from weakness, muscle imbalance, or overuse.

- **Equipment:** Bench for bench press, lifting bar and weights, medicine balls or basketballs, jump ropes
- **Time Required:** 30 minutes to one hour
- **Supervision:** One or two coaches

The Level I routine begins with 4–5 minutes of easy continuous running followed by 10 minutes of preparatory stretching. The strength/fitness circuit should take

20–40 minutes. The number of sets and repetitions vary substantially. The key point to consider is the volume of work and its intensity must increase gradually. Athletes should begin conservatively and progress.

The Fitness Circuit

Push-ups (Up to 5 sets of 2–10 reps with 30–60 seconds rest, depending on ability.)

Pull-ups (Up to 5 sets of 2–10 reps with 60–90 seconds rest: weaker athletes may be assisted by partners until they gain sufficient strength.)

Lunges side and forward (up to 5 sets of 20 performed with alternating legs).

Box step-ups holding dumbbells in each hand. (Athletes should do up to 10 sets of 5-10 reps, boxes or benches should be 6–18 in height, weight should range from 5–20 pounds depending on the athlete's strength. Small 5 or 10 pound plates from the weight room may be substituted for dumbbells.)

Abdominal Crunches (up to 100 in sets of 10–20). When conditioning the stomach muscles, an athlete does not need to rise more than 30-degrees off the ground. Beyond that point the psoas muscles do the majority of the work, placing substantial stress on the lower spine risking injury.

Standing long jumps into sand, grass, or wrestling mats (up to 5 sets of 3 jumps with both feet together).

Medicine ball tosses or homemade weighted balls of 3–8 pounds. Choose 2 or 3 of the following exercises:

- *Overhead toss* (2–4 sets of 10)
- *Forward toss* (2–4 sets of 10)
- *Side toss* (2–4 sets of 10, each side)
- *Triceps toss* (2–4 sets of 5)
- *Two-handed basketball pass* (2–4 sets of 10)
- *Straight-armed forward toss,* kneeling position to partner (2–4 sets of 10)

Note: Obviously, obtaining medicine balls for as many as 100 or more athletes is impractical. Incorporating medicine ball exercises into the circuit will reduce the number of balls required.

The program is concluded with five minutes of easy *jump rope* work. Jumping rope is an excellent way of developing rhythm and movement skills.

Sample Workout - Level I (2–3 sessions per week)

Day 1 — Jog five minutes, stretch ten minutes, push-ups, lunges, medicine ball, curls, sit-up crunches, jump rope.

Day 2 — Jog five minutes, stretch ten minutes, pull-ups, step-ups, machine bench press or medicine ball, sit-up crunches, jump rope.

Day 3 — Alternate between day one and day two routines.
This program may be done during a PE class or as part of track and field practice. If done during practice, the strength training circuit should follow the event-specific workout.

LEVEL II

The Level II routine is recommended for the majority of high school track and field athletes. This routine does not pretend to be the optimal strength training program, but it does provide good strength and power training within the constraints faced by most high school programs. It can accommodate a fairly large number of athletes and requires limited equipment and supervision.

As with Level I, the Level II routine should be done two to three times per week depending on the training phase and event specialty.

- **Equipment:** Level I equipment plus weight machines
- **Time Required:** 30 minutes–one hour
- **Supervision:** One or two coaches

At this level, weightlifting machines provide a number of relatively safe exercise options; for example, bench press, leg press, lat-pulls, pull-ups, sit-ups, seated or standing press, hamstring curls, chest flies, triceps extensions.

Using machines increases the number of athletes that can weight train safely. *For basic fitness, 10 repetitions per exercise with 30–60 seconds' rest between sets or exercises is recommended.* The circuit can accommodate about 15 people at a time.

Sample Circuit — Level II (2–3 sessions per week)

1. Bench press
2. Incline bench
3. Leg press
4. Seated press
5. Standing press
6. Sit-ups
7. Pull-ups
8. Dips
9. Step-ups
10. Side lunges
11. Forward lunges
12. Partner medicine ball
13. Jump rope
14. Triceps work
15. Lat-pulls
16. Hamstring curls

Once good, general fitness has been attained, circuit training should give way to specific exercises in a set pattern of training. Repetitions should then be reduced and the weight increased. For example, an athlete sould do only six to eight exercises but use three to four sets of five to eight repetitions for each.

A coach must realize that such training requires attentive planning and execution to be effective. Weight room training poses special problems for large track and field squads. Coaches need to plan and direct their athletes on proper technique when lifting, paths to follow between stations, and proper places to rest when not lifting.

With the incorporation of weightlifting, safety considerations become more important. **Caution: Lifting too much weight too soon and/or improper technique will likely lead to injuries, especially back problems.**

- **Don't let athletes arch their backs while doing the bench press.**
- **Don't try to maximize results in the leg press.**

LEVEL III (2–3 SESSIONS PER WEEK)

The Level III program is designed for athletes who have become proficient at Levels I and II and who participate in events where power is an essential component of successful performance. Throwers, jumpers and sprinters will benefit most from the intensive strength and power development of this program.

Although weight training of this sophistication is often broken down into four or five sessions per week, such a schedule is very rarely feasible for high school athletes. Available time, competition schedules, supervision and multiple event demands limit the amount of training athletes and coaches can accomplish. When one imagines a situation of two or three coaches with 100 or more athletes competing twice a week in various events, the limitations become obvious. For such reasons, this program is designed for two or three lifting sessions per week.

This routine does encompass a number of advanced lifts which may present a risk of injury, so correct technique becomes essential. Serious injuries can result from improper lifting, inattention, or carelessness.

***Qualified supervision is an absolute requirement.* If a coach does not have sufficient weight training knowledge to teach these lifts, then that coach should wait until he or she has received proper training, find a qualified strength coach to teach and supervise the athletes, or eliminate the lifts completely!**

Athletes must understand that strength training at this level must be taken seriously. There is no room for casual attitudes and horseplay. Focus, discipline and intensity are the keys to advanced weight training success.

This program may not be appropriate for all athletes. Both physical and emotional maturity are prerequisites to intensive weight training. Basic strength, flexibility and coordination should be well-developed before beginning this type of training. Younger athletes can still realize substantial benefits from the Level I and II routines. Older athletes without the proper attitude don't belong with this group either.

- **Equipment:** Levels I and II equipment, plus weightlifting platforms or matted surfaces, power racks, Olympic lifting bars, incline/decline benches, dumbbells, bumper plates
- **Time Required:** 45–90 minutes per session
- **Supervision:** One coach per 10 athletes

The coach must understand the proper technique for the following lifts:

- Power cleans*
- Snatch*
- Back squats*
- Bench press*
- Front squats
- Shrugs
- Pulls

- Dead lifts
- Good mornings
- Clean-and-jerk
- Jerks from the rack (both front and back)
- Seated and standing press (front and back)
- Incline bench press
- Decline bench press
- Front and side lunges

Not all of these lifts are done at every session. A single lifting session would include only a small number (approx. 3–5) of the above lifts. The core lifts of this program are marked by asterisks; they should be the foundation of any advanced routine.

A number of secondary lifts should be done as well. These lifts should address specific weaknesses or muscle imbalances in each athlete and should also be done to reduce the possibility of injury. Hamstring curls are especially recommended for all track and field athletes. Other lifts include terminal quadriceps extensions, lat-pulls, triceps extensions, good mornings, etc. Abdominal exercise should always be part of any strength training regimen.

Athough calf raises are traditionally a staple of most workout routines, the amount of running and jumping done by track and field athletes creates a tremendous amount of work for the lower leg. Calf raises have a tendency to overstress the calves, making recovery between workouts difficult. If any lower leg strengthening is to be done, it should focus on the small muscles of the ankle and anterior tibialis (front of the lower leg). These exercises provide greater leg stability and lessen the tendency to develop shinsplints – the bane of many coaches' existence.

PERIODIZING WEIGHT TRAINING

A basic routine for coaches who only have six to 12 weeks to work with athletes should begin with the following:

Day 1 — Power clean, bench press, lat pulls
Day 2 — Snatch, back squat, incline bench
Day 3 — Power clean, bench press, front squat

The program is divided into three phases.

For the first third of the cycle (i.e., for someone available for nine weeks this would encompass three weeks), volume and intensity are six sets of six at about 60%–70% of maximum effort for that specific lift.

The second third of the program is two sets of six, two sets of five, two sets of four per workout at 65%–75% of maximum effort.

The third phase of the program is one set of five, two sets of four, two sets of three, one set of two per workout starting at 65% and ending the phase at 90%–95% of maximum effort for that specific lift.

This program is for athletes who have already proven themselves at Levels I and II. Rather than sacrifice technique at this point, athletes should stay with five to six repetitions at 60% to 65% of maximum effort until the athlete has mastered proper lifting technique.

Recovery intervals between sets during the workout must be controlled just as they would be with repetition track workouts. Athletes should be given time to lower their heart rates to a level that allows them to continue the workout properly. With the core lifts, the usual rest between sets is two to four minutes, depending on the workload; therefore, a workout of five sets of five repetitions of cleans should last about 30 minutes (e.g., ten minutes warm-up, one minute for each set, two to four minutes for recovery between sets).

Secondary or assistance lifts should be done only if there is enough time after the core lifts are completed. These lifts include, but are not limited to, hamstrings curls, quadriceps extensions, calf raises, side sweeps, lat-pulls, lateral cable exercises, rowing exercises, preacher curls, strict curls, seated press, decline bench press, triceps extensions and good mornings.

If a coach has only five weeks or less to work with an athlete, a lifting program is not recommended. Too much general soreness accompanies the first three weeks of weight training. A rest of 7–10 days before the most important meet of the year is recommended. Refer to Chapter Three to help with the periodization of training based on a full season.

With a program lasting 12 weeks or longer, jumpers and sprinters should take two to four days rest from the weights before a major invitational or league meet and 10–14 days' rest from any hard weights before section or state champoinship meets. If, after 8–10 weeks of weightlifting, the athlete is no longer seeing improvment on the track or field, the workouts should be tapered.

With athletes in all events, weight training should cease as early as 3–4 weeks before the final championship meet.

Throwers, 400 meter sprinters, triple jumpers and pole vaulters usually continue to improve during an intensive weight training period or cycle. These event areas rely a good deal on muscular power; therefore, as fitness improves through weight training performance improves as well; however, peak performance cannot be expected until intensive weight training is stopped and the athlete has fully recovered.

Sprinters, hurdlers and jumpers need to be relatively fresh to perform well. As the season advances, it is wise to back off intense weight training and intensify the running and plyometric training.

As a general rule, once basic fitness has been achieved, a strength training program should emphasize intensity over volume. Intensity, however, must be followed by adequate recovery in order to see appropriate increases in performances on the track. Recovery is part of the training process, not the absence of training.

In the rare case where a coach can engage an athlete in a year-round program, modified periodization schedules should be applied; however, all programs should incorporate a cycle of six to ten weeks of high-volume/low-intensity training if possible.

Following a basic fitness cycle, a coach has the option of different methods:

- The loading-unloading method an athlete trains at high intensity/low volume for two or three weeks followed by one-week of low intensity/low volume (this is referred to as an unloading week).
- A five week pyramid cycle – increasing loads followed by one week of rest from weightlifting. (This method works well after the base period.)

  Week 1 — 5 sets of 5
  Week 2 — 5 sets of 4
  Week 3 — 5 sets of 3
  Week 4 — 5 sets of 2
  Week 5 — 4 sets of 2

The first cycle is then followed by another identical cycle of five weeks. The only difference is greater amounts of weight are lifted over the previous cycle. If this method is used during the season, sprinters and jumpers should greatly reduce their weight training after the second cycle. Throwers can do a couple of two or three week pyramid cycles of high intensity and low volume.

STRENGTH TRAINING FOR LARGE TRACK AND FIELD TEAMS

Some coaches consider organizing strength training for their entire team almost an impossible task. The number of athletes and event specialties make the planning of strength training a complicated task. This is especially true in the case of programs that have as many as 300 athletes in a combined girls' and boys' team. In such a situation, it is nearly impossible to arrange weight training for the entire team at one time. Creative thinking becomes necessary.

The first limitation a coach needs to address is the capacity of the weight room. A weight room with two or three Olympic bars, a single set of dumbbells and some type of weight machine may likely handle approximately 25 athletes-that is not a large number.

One solution to solving the problem of so many athletes and so little equipment is to create a strength circuit that does not require use of the weight room. The Level I routine can be done entirely on a field or in a large multi-purpose room. This should cover the strength training needs of all your distance runners and least mature athletes.

A second potential solution is to have your throwers use the limited weight training facilities early on non-throwing days. This would allow them do the heavier lifting they need without interference from the other members of the team; consequently, it also frees up the weight room for the jumpers and sprinters to use following their primary training on the track.

A third solution is to alternate the days on which different event training groups use the weight room. This can be complicated since most track athletes compete in multiple events.

Morning sessions are another potential solution; however, the desire to get athletes into the weight room shouldn't supercede or encumber the athlete's' ability to complete the primary workouts for that day on the track. Athletes should not be exhausted prior to their more important track sessions, especially in technique events such as the pole vault or high jump.

Anything a coach can do to break up the team into groups for strength training will help. Some additional suggestions might be to prioritize event groups and individuals for access to the weight room. Generally, throwers should receive preference, followed by jumpers, vaulters, sprinters/hurdlers and, finally, distance runners.

Another important consideration is the problem of adequate supervision. It may be best to assign an assistant coach whose primary responsibility is to oversee strength training and supervise all weight room activities.

The Lifts

THE SQUAT

No lower body lift has more of a dramatic effect on speed and power than the squat (Fig. 4-1). It can also be the most dangerous lift if proper preparation and technique are not used; however, if properly executed the squat can be quite safe.

To introduce the squat to athletes, begin with light weights to help develop proper technique and to help the athlete learn the balance that is required for safe lifting.

The athlete should start with what is known as **high bar** squatting. That is, the bar should rest on the trapezius muscles about two inches below the neck. (The more advanced **low bar** placement used by powerlifters should be reserved only for very advanced athletes, not high school lifters. In that style, the bar is placed four to six inches below the neck. It requires a very strong back and well-developed squat technique. When beginners try to lift in this position, they tend to lean too far forward and lose their balance.)

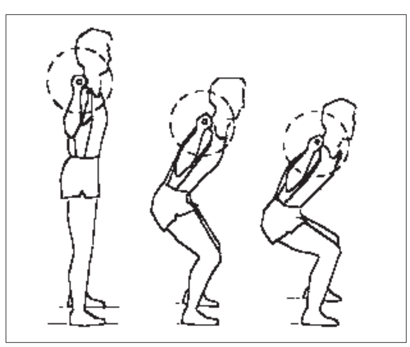


Fig. 4-1. The Squat.

With the bar on the trapezius and the hands spaced evenly on the bar several inches outside the shoulders, the athlete lifts the bar off the supporting pins of the squat rack and steps back to the starting position.

The initial stance can be adjusted according to the muscles targeted and the flexibility of the athlete. If the lifter has poor flexibility, then a base four to six inches wider than shoulder width will yield the best results. Place the feet with the toes pointing out 20- to 45-degrees, depending on body-type. Make sure the heels stay in contact with the ground at all times. Not only should the heels be on the ground but the bulk of the weight should be felt there. In a properly executed squat, the athlete should actually be able to wiggle his or her toes throughout the lift. If the weight of the lifter rolls forward onto the toes, the toes will stop wiggling and the lift is no longer being performed efficiently. Squatting correctly requires great flexibility in the ankle, knee and hip joints.

The key to the squat is to keeping a *tight* torso and a straight back while lowering the bar under control. While the athlete descends, he or she should maintain his weight on his or her heels. Pushing the chest and stomach out will compress the lower back. This is referred to as *keeping the torso tight* and helps protect the lower back from injury. The athlete should focus on using the gluteals and the hamstrings to control the pace of the descent.

A parallel squat is attained when the upper thigh/femur, line from knee to hip, is parallel to the ground.

A full squat is attained when the buttocks drop past the parallel level and the hips roll under. At the point where the hips roll under, much of the weight of the squat is transferred from the quadriceps onto the more powerful and capable muscles of the buttocks, hamstrings and hip flexors. If the athlete is not on his heels, this transition from parallel to full squat cannot take place.

As the lifter completes the descent, he or she keeps the torso tight and pushes back up to the starting position. The knees should not be allowed to turn inward at the bottom of the lift. The knees should stay over the toes at the bottom of the squat.

The eyes should look straight ahead during the entire lift. Many athletes tend to look at the floor which causes them to lean forward excessively.

Also, both feet should be spaced evenly and in line with the body. Some beginners tend to place one foot forward or back.

When returning the bar to the rack, the athlete should not rush back or catch his or her hands on the supports. This is a dangerous time because of fatigue. Mistakes can take place easily.

Caution:
Don't force a full squat on those athletes who may have poor flexibility or poor balance; furthermore, don't allow those same athletes to attempt to lift more weight until they have developed proper technique.

For track and field athletes, a properly executed full squat with light weight is much more valuable than a heavy partial or parallel squat where only the quadriceps are recruited/innervated to move the weight.

Caution:
If the lifter's heels lose contact with the ground while he or she islowering the bar, the exercise is being done incorrectly, endangering the lifter's knees.

If a wide base and supports don't prevent athletes from leaning forward, have them do stretching exercises and squats without weights and until they can lift correctly. For some athletes, a half or three-quarter squat may be more appropriate until they achieve the skill and flexibility to go to a full squat. Never encourage increased poundage at the expense of good technique. This will only lead to muscle imbalances and injury. Reward technique, not tonnage!

The front squat, which develops the quadricep muscles more than a back squat is performed in the same manner as the back squat, except the bar is held in front of the lifter much like the catch position in the Olympic lifts. The bar rests along the clavicles in the grooves that are created by the anterior deltoids when the arms are extended straight in front of the lifter. Elbows are held high away from the torso or the arms can cross over each other in an attempt to control the bar.

THE POWER CLEAN

The power clean is divided into three active phases and two recovery phases (Fig. 4-2).

Phase I is the starting position. First, the lifter stands with feet flat, slightly less than shoulder width apart, and the bar about three to four inches over the shoes. The hands grip the bar evenly spaced one to two inches outside the legs. The wrists rotate inward and both elbows lock, pointing sideways. The back should be straight, with the torso arched slightly and the shoulders back. The chest should be a few inches in front of the bar so the back assumes a 45-degree angle to the floor. At this point, the hips should be a little higher than the knees, with the eyes focused straight ahead, not up.

Phase II is the pull to the knees. This is where most athletes make the mistake of overworking the lift and they lose proper technique. The weight should be moved by using the large muscle groups, not the arms. The bar is lifted by straightening the legs and lifting the hips. The lifter must keep the chest over the bar. The initial movement to clear the knees will shift the center of gravity from over the balls of the feet to over the center of the feet. Curling the wrists inward as much as possible keeps the bar as close as possible to the shins and the lower thigh. At no point during this phase are the elbows to bend. The arms are to remain locked with the back as tight and straight as possible.

Phase III is the acceleration. The hips are driven forward forcefully and the torso is driven back and up. This movement allows the large muscle groups to act upon the bar, creating great acceleration. As the hips drive forward, the weight shifts to the balls of the feet and the athlete tries to get as tall as possible. A quick way for a coach to spot a major error is to see if the athlete stays flat-footed (Fig. 4-3). The athlete

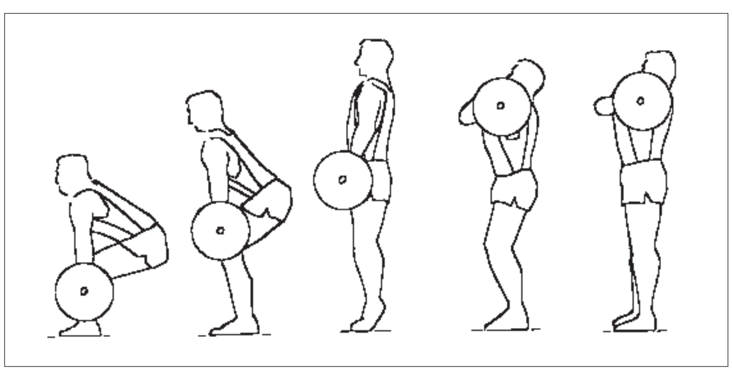


Fig. 4-2. The Power Clean.

should actually rise onto the balls of the feet. If the lift is executed properly, the bar will make hard contact with the mid-thigh. As the bar travels upward, the trapezius muscles contract forcefully in a shrugging motion. Raising the elbows as close to shoulder level as possible creates the final pull on the bar. It is important not to pull back with the elbows but to point them away from the body (Fig. 4-4).

Phase IV is the recovery. When the bar reaches its highest point, a slight flexing of the hips and knees will act as a shock absorber upon completion of the lift. The bar is trapped as the elbows go from the side to the front of the body. The upper arms must be held parallel to the ground. Most beginners catch the bar with the elbows close to the torso. The final resting place for the bar is along the clavicles, with pressure from the high elbow position keeping the bar in place.

It is a dangerous mistake to bend backward in order to catch the bar (Fig. 4-5). The bar should be caught with the torso erect.

Another error inexperienced lifters may make is jumping or throwing the body unevenly in order to make the lift. The feet can move a few inches to either side but not forward or backward. In general, the feet should stay where they begin.

During the fifth phase **(Phase V),** the weight returns to the starting position. Here, cleans become a problem for weight rooms without bumper plates or padded surfaces. The bar can be lowered safely to the floor if done in stages. While keeping the torso tight, the bar is lowered from the rack position on the chest to the hip area. Then the bar is lowered slowly along the thigh and eventually to the floor. The back must remain straight using flexed legs to prevent straining the lower back.

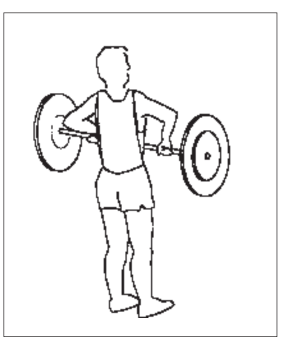


Fig. 4-3. The athlete should not muscle the bar up by keeping the feet flat and pulling just with the arms.

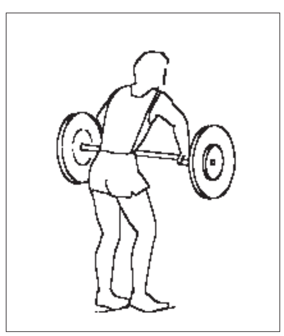


Fig. 4-4. During the pull, the athlete should not pull with the arms before extending the body.

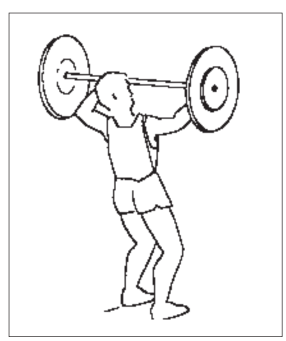


Fig. 4-5. The athlete should not swing the bar out and up while bending the body backward.

The rhythm of the lift is very important. Movement should be slow to fast, depending on the physical skill of the lifter. If an athlete rips the weight off the floor as fast as possible, lower back problems usually result from the premature use of the arms and shoulders. The lifter should never struggle for control at the end of the lift. Coaches should reduce the amount of weight if this appears to be occuring.

Flexibility of the ankles, hips, shoulders and wrists is a major factor affecting technical proficiency. If an athlete is inflexible in these areas, a remedial stretching routine must be undertaken. Meanwhile, only light weights should be lifted until the coach sees an improvement in flexibility.

Flexibility Problems

- **Poor Ankle Flexibility:** The athlete is not able to keep his or her heels on the ground in the basic starting position. Remedies include adding an extension to the heel of the lifting shoes, doing dead lifts to gradually stretch the ankles and lower calves, and to complete a general stretching routine daily.
- **Poor Wrist Flexibility:** This is a real problem when it comes to catching the bar at the end of the clean or front squat. The athlete will be unable to hold on to the bar with elbows high and away from the torso. A good exercise to begin to remedy this problem is to put a bar on a squat rack at shoulder level and have the athlete rotate the elbows up while keeping a good grip on the bar. This is also a good warm-up before lifting. As flexibility improves, the athlete can roll the bar toward the end of the fingers at the end of the catch in order to relieve the pressure on the wrists.

SNATCH

(Please refer to the section on the Clean, as needed.)
Phase I is identical to the power clean (Fig. 4-6) except for the placement of the hands on the bar. In this lift, the athlete grips the bar wide enough so the bar rests at approximately hip height in the standing position. The bar is lifted off the ground in the same manner as the clean, using the large muscles of the legs and torso. The arms should be straight.

Phase II is the pull from the knees to the hips (Fig. 4-7). This is performed just as in Phase II of the clean. The difference is that with the narrow grip of the clean, the bar ends up at mid-thigh. With the snatch, the bar should end up at or near the hips.

Phase III is the acceleration (Fig. 4-8). (Also refer to the description of the clean.) Thrusting the hips forward and up is essential. Too much lifting with the torso places stress on the back and destroys balance. This will also put the bar dangerously in front or in back of the body as the arms lock out at the top.

Phase IV is the active shrug of the shoulders and explosive rotation of the elbows as the bar is moved overhead in one motion (Fig. 4-9). Here, the athlete must keep the wrists firm with the backs of the hands facing the ceiling. At this point, the violent forward/upward displacement of the hips, much like in a jump, moves the feet a few inches to either side.

As the athlete throws the bar overhead, the head stays level and the eyes look straight ahead. There should be no looking up or down. At the finish, the bar should be directly over the heels of the lifter and the lifter's back should be erect.

One typical error inexperienced lifters make is for the bar to be caught several inches behind the heels. This hyperextends the shoulders and can result in injury. Another error is lifters sometimes drop their head. This pushes the bar in front of the body and pulls the lifter forward. Coaches should teach their athletes to escape a poor lift by pushing off the bar so the athlete goes forward while the bar drops behind the athlete. Failed lifts are why bumper plates or rubber matting are needed to prevent damage to the bar and weights.

Safety Considerations for Olympic Lifts

The snatch should be done only by advanced athletes with proper equipment and direct supervision. With all Olympic lifts, there is the chance of teammates being

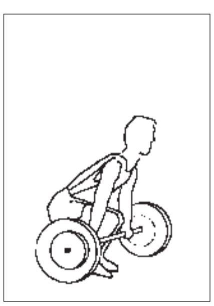


Fig. 4-6. Phase I.

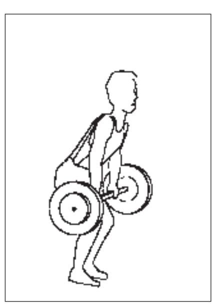


Fig. 4-7. Phase II.

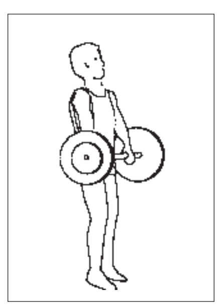


Fig. 4-8. Phase III.

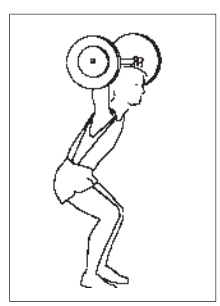


Fig. 4-9. Phase IV.

injured if a bar is dropped.

Caution:
Coaches should never let anyone sit anywhere near the lifter.

Also, good traction is very important for all lifts. The best surfaces on which to lift are plywood platforms (do not paint or varnish the wood), rubber flooring (single unit flooring prevents a lifter from catching a foot on the seams) and non-slip surfaces on concrete. Avoid smooth concrete, waxed floors, slick carpeting, wet or uneven surfaces. Make sure there is room to escape a bad lift so the athlete does not crash into the wall, benches, or racks. Always keep loose weights, bars, medicine balls, etc., out of the active lifting area.

Shoes should have good support. Athletes should never lift with sandals or in bare feet. A slightly raised heel is preferred. It is advisable that lifters either use gloves or chalk up the grip areas. Rough bars can abrade the skin on the hands very quickly. Because of the impact on the thighs and hips, it is also recommended lifters wear sweat pants or tights.

An Olympic type bar in good condition is to be used for these lifts. These bars have revolving sleeves which allow the bar to rotate and will not cause injury to the wrists.

A good weightlifting belt is mandatory to protect the lower back of the athlete. Belts are sold in most sporting goods and weightlifting stores.

If a school does not have the proper equipment and space to perform the Olympic lifts safely and correctly, they should not be included in the program. While these lifts are the cornerstone of the training of nearly all elite athletes, the athletic power gains made by doing these lifts in less than ideal conditions can often be matched or exceeded by a well planned and executed plyometric program.

THE BENCH PRESS

Perhaps no lift is as popular with high school athletes, and gives less in return athletically, than the supine bench press. With the exception of the shot putters and discus throwers, the bench press can be considered an auxiliary lift for all other track and field athletes.

The supine bench press (Fig. 4-10) develops the chest and arms noticeably, which appeals to the vanity of young athletes. There is a definite need for upper body strength in most sports, but lower body and back strength are far more important for performance.

To perform the lift, the athlete lies on the back with each foot spaced about twelve inches from the side of the bench. The feet maintain contact with the ground by having the heels touching. The head rests on the bench with the nose and eyes directly below the bar. The lifter grips the bar outside the width of the shoulders. The width of the grip is determined by mechanics, comfort and arm length. Most bars will have knurled markings to ensure a symmetrical grip.

After a couple deep breaths, the lifter inhales and pushes the bar up from the bench supports. (Sometimes a spotter helps to pick up the bar, depending on the amount of weight and bench construction.) With the arms fully extended, the athlete stabilizes the bar before attempting the lift.

When the lifter is ready, the eccentric, or descending, phase of the lift begins. Lowering the weight should be done under control with no sudden surges in speed. The bar is lowered to the bottom of the pectorals until it touches the chest. The weight should always be controlled and should not bounce off the chest.

The next step is the drive off the chest (concentric, or ascending, phase). The lifter pushes the bar up in a slight arch toward the upper chest. This keeps the elbows in line with the direction of force on the bar.

When the repetition is complete (elbows locked and the bar stabilized), the next repetition is attempted.

During the push off the chest, the lifter should make sure the buttocks maintain constant contact with the bench. If the lifter raises the buttocks to finish the lift, lower the weight and maintain proper technique.

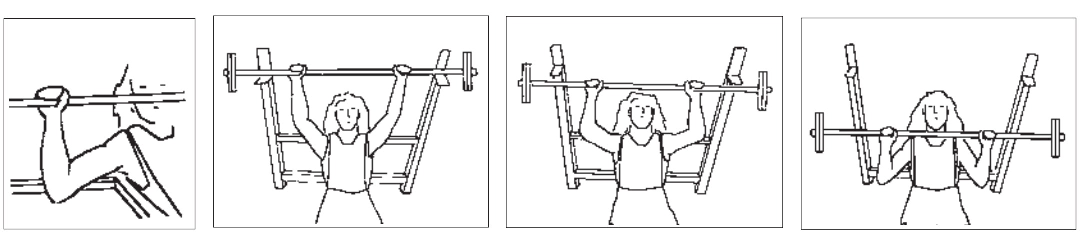


Fig. 4-10. The Bench Press.

To isolate different areas of the upper body, narrow or widen the grip. Wide grip bench presses emphasize the pectorals and lats. Narrow grip bench presses isolate the arms and work the triceps and forearms.

Incline bench presses allow less weight to be lifted and, furthermore, are more difficult to spot. Nonetheless, this lift is important to develop upper body strength and stabilize the shoulders. With the incline press (usually a 45-degree angle), the lifter performs the same routine as with the supine bench press. From the lock-out position, the bar is lowered to the upper pectoral, one to two inches from the clavicle. The bar is driven up keeping it between the elbows and the chest. One of the big errors made by beginners is pushing the bar out from the chest instead of up toward the chin. This can cause the lifter to lose control of the weight. As with the flat bench press, the feet should be flat on the ground with the buttocks maintaining contact with the bench at all times.

TECHNICAL APPENDIX

The following drawings illustrate several of the most common errors made by athletes while performing the core lifts. These drawings should be used as a guide to teaching sound fundamental lifting technique.

Common Questions

Should my athletes use machines or free weights?
Free weights will create more balance and coordination in the musculature. For most track and field athletes, free weights are a superior choice; however, certain movements are better accomplished on machines. The pulling movements such as rows and lat pulls lend themselves particularly well to machines. Machines are also great for circuit type training and for beginners.

When should I use barbells vs. dumbbells?
Barbells are used for the “large” lifting movements i.e. squat, supine bench, incline bench, military press, upright rows etc. Dumbbell training for these movements allows for a much larger range of motion and will demand all of the stabilizing muscles within a joint be recruited. Dumbbells are a great way to mix up a training regimen and increase the variety of workout possibilities.

I don't have access to a weight room, how can I get a lifting workout done?
Bodyweight exercises, also known as gymnastics, offer a great alternative to a formal weight room.

In addition, if you have access to medicine balls, stadium steps or a long hill, the opportunities for strength training are nearly limitless.

Some sample exercises include:
Push-ups (on inclines, declines and level ground)

Pull-ups

Body weight squats

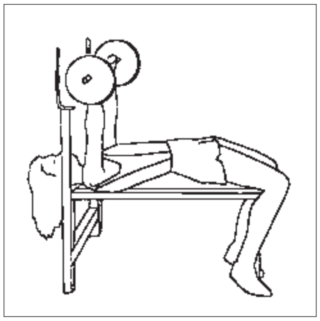
One-legged squats

Lunges (forwards, backwards and lateral)

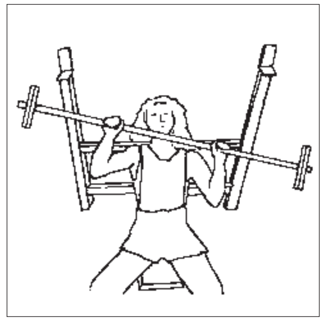
Box step ups

Running/bounding stairs

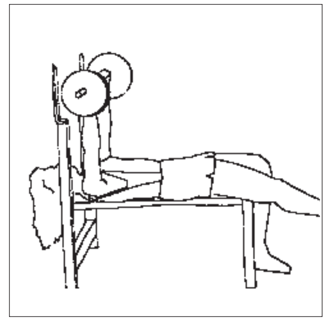
Running/bounding hills



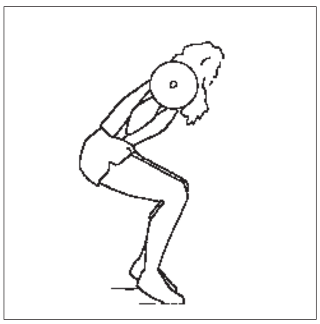
When the athlete pushes the weight up, the hips should not be lifted off the bench.



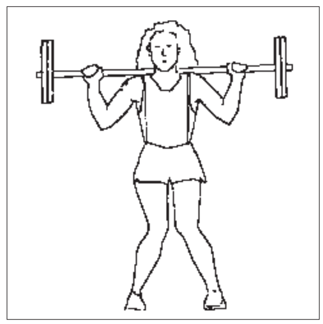
The bar should not be pushed up unevenly.



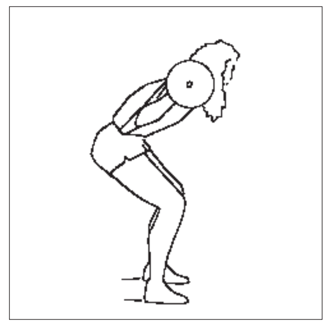
During the entire exercise, the body stays stationary and the legs should not move or extend.



Make sure the heels stay in contact with the ground at all times.



Knees should not turn inward.



Looking at the floor can cause the athlete to lean forward excessively.

CHAPTER

5

Plyometric Training for Speed-Strength

Traditionally, training for power has been done by training for strength first (in the form of calisthenics and weightlifting) and then training for speed and quickness. Although both forms of training contribute to success in track and field, neither addresses the *specific* requirement of explosiveness—the ability to combine strength and speed. The basic principle of specificity demands that power training incorporate elements of strength and speed simultaneously. One such type of training, particularly well-suited to track and field is called **plyometric exercise**.

A Philosophy of Plyometric Training

The goal of any athletic training program is to improve the specific physical capacities needed for that sport. Track and field athletes need good general strength, speed, specific muscular endurance, and especially the ability to be explosive or powerful. That is, athletes must train to exert the greatest amount of strength in the shortest time possible. Even middle and long distance runners need to possess the ability to respond powerfully to the demands of a given race.

Fundamentally, track and field is a sport of explosive movements. Consider the events of the sport. All require specific skills, movements and running to be conducted in very short moments of time. With the exception of the distance events, the events of track and field are inherently power oriented activities.

In the 100 meters, for example, each foot contact with the ground is completed in a fraction of a second. Even in the longer races, mid-race surges and finishing kicks demand that athletes respond quickly and powerfully. A primary objective of training for track and field, then, must be to develop the ability of the individual to perform each event with the optimum degree of explosiveness.

The Physiology of Plyometric Training

The term plyometric, as derived from its Greek root, means to increase or augment. Such training has been used systematically in track and field by European coaches and athletes for nearly 25 years, although most American coaches consider it a recent phenomenon. In fact, most athletes have been doing some form of plyometric exercise all their lives. Jumping rope, playing hopscotch, leaping from the front porch, skipping and bouncing are all plyometric movements. Understanding the mechanisms, techniques and proper application of plyometric training, however, is essential for it to be properly integrated into a system of training that will benefit the track and field athlete.

Plyometrics are exercises that aim to develop explosive ability by conditioning the neuromuscular and elastic characteristics of the muscle. Strictly speaking, plyometric training is a method of training as opposed to a specific set of exercises. An athlete does a certain drill or exercise in a plyometric manner. While there are certain types of drills and exercises that lend themselves easily to plyometric training for track and field, the key to their usefulness lies in proper execution and application. When done correctly, plyometrics combine strength and speed by developing the explosive, reactive movements that comprise throwing, sprinting and jumping.

The main objective of plyometric training is to produce greater power by training the muscles to contract more quickly and forcefully from an actively pre-stretched position. The effectiveness of the exercise relies upon the conditioning of the myotatic, or **stretch-reflex**, mechanism and the natural elastic properties of the muscle. Body weight and gravity are used to load elastic tension within the muscles, which is then released in a muscular contraction much more forceful than normal. In simpler terms, when a muscle is stretched quickly, it tries to protect itself by contracting. This is called an eccentric contraction: a contraction where the muscle is forced to lengthen even though it is trying to shorten itself. (Try making a muscle with your biceps and then pull your forearm toward the ground.) The counterpart of this is concentric contraction, where a muscle shortens as it is contracts. This is what is usually thought of as a muscle contraction. A concentric contraction is much stronger when it is preceded by an eccentric contraction. In an eccentric contraction, the muscle reacts very powerfully against the rapid stretching. This reaction is the stretch-reflex.

The strength of the stretch-reflex is a consequence of how fast a muscle is stretched. When a muscle is stretched quickly, rather than slowly, it is placed under greater tension, storing a greater amount of elastic energy within the muscle. A fundamental principle of plyometric training is the muscle needs to be pre-stretched quickly. The rate of stretch of the muscle is much more important than the degree of stretch. For example, suppose athletes are doing plyometric exercises in the form of two-legged hopping. To achieve the proper effect, the athletes should jump, land and rebound with as little time spent on the ground as possible, as opposed to jumping, landing, and then sinking in a full squatted position before attempting to perform the rebound hop. When the eccentric contraction is slowed, the stretch-reflex mechanism is negated and the exercise loses its plyometric quality. Again, the rate of stretch, not the amount of stretch, is the key to training the muscle plyometrically.

Principles of Plyometric Training

Successfully incorporating plyometric exercises into training programs for track and field athletes requires more than knowing how the muscle is affected during exercise. The best results are achieved when both the coach and the athlete understand the role of power in a respective event and how to integrate and correctly apply plyometrics to an athlete's overall training. Plyometric training requires the same careful attention, application, and periodization as training for an individual event. The goal of plyometric training is to develop the power and explosive ability that is the key to success in nearly all track and field events.

In constructing a plyometric regimen, the coach must keep in mind the general and specific principles of training. Not adhering to these basic tenets leads to poor results and exposes the athlete to a substantial risk of injury. The universal principles of track and field training must be followed in any plyometric program:

- Progressive overload
- Specificity
- Recovery
- Individuality
- Variability

Variation is especially important for plyometrics. Research in strength training shows the muscular system responds best when the stimulus is varied over time. The neuromuscular system needs to be shocked so it will be forced into adapting. With plyometrics, this means doing different types of exercises some days or varying the number of repetitions or the intensity.

Beyond the universal principles of training, there are principles specific to plyometrics. As a unique form of exercise emphasizing explosive movement from a pre-loaded and pre-stretched position, plyometrics has its own particular set of considerations to be followed.

BASIC STRENGTH

The overload of the muscular system by the combination of body weight and gravity requires a basic level of strength to ensure against injury when performing explosive movements.

Opinions vary as to the degree of strength needed. Some authorities suggest that the most rigorous forms of plyometrics, such as depth jumps and one-legged box jumps demand that an athlete be able to squat 150–200% of his or her body weight. The vast majority of high school athletes would not meet this standard.

Two rules of thumb apply here. First, athletes should start with the most general and lowest level of plyometric exercises. Low intensity and limited repetitions are suggested for beginners and younger athletes. The coach must also take the athlete's body weight into consideration. The same drill will produce more physical stress upon the heavier athlete than on a lighter athlete. In adolescence, strength in relation to body weight is often poorest among those who are the heaviest. Second, if the athletes are capable of performing the exercise explosively with correct technique, their strength is probably adequate for the particular exercise. If they are not capable of performing the task properly or execution breaks down after a few repetitions, then the athletes need to develop greater basic strength before moving on to more advanced drills. This cautionary note is especially appropriate for young athletes who are usually in a hurry to do the most advanced work first.

The key to plyometric training is performing technically correct, explosive movement. Doing the exercise improperly only subjects the athlete to the threat of injury.

RAPIDITY OF STRETCH

Muscle exerts maximum tension when it is stretched rapidly. Landing after a two-legged hop produces much greater tension in the quadriceps than simply lowering oneself into a squat from a standing position. The stretch-reflex is utilized best when the involved muscles are stretched quickly.

RATE VS. DEGREE OF STRETCH

A corollary to the previous observation is the rate of stretch is more important than the degree of stretch. It is better an athlete do a jumping movement in a quick, bouncy manner rather than slowly sinking to a low squat and then rebounding. Doing jumps slowly is not plyometric and lessens the effect of training.

EXPLOSIVE MOVEMENT

The goal of plyometric training is to increase power; therefore, the emphasis should be on reacting explosively immediately upon contract. This is the kinetic moment that is being trained. The execution of the exercise should be forceful, but most importantly, done quickly. No gathering should take place before the explosive response.

TECHNIQUE

With any explosive movement, proper technique maximizes improvement and reduces the chance of injury. Sound fundamentals are especially important for younger and less experienced athletes. Correct technique is a good indicator the athlete is not over-stressed by the exercise.

FATIGUE

Plyometrics are deceptively exhausting to the muscles. The athlete may even feel more energetic near the end of a workout session than at the beginning. The coach must be aware of the athlete's fatigue. Breakdowns in technique and reduced height and distances in drills indicate fatigue. This is when the exercise or session should end.

CAUTION WITH PLYOMETRICS

Although plyometric training is generally accepted as a valid training method, it does have its caveats. Because of its ballistic nature, there is a risk of injury to the athlete. Plyometrics used improperly can easily lead to injury or overtraining. A coach must be especially attentive and careful to ensure that plyometrics are used correctly.

- A conservative approach to the use of plyometrics for high school athletes is recommended. Adolescents are susceptible to a variety of injuries. Most high school students are still growing, have softer bone structure than adult athletes, and have not yet developed the absolute strength to handle the more advanced and demanding plyometric drills. Coaches often design programs for their best athletes, forgetting that the capacity of other team members is much less. Athletes will not benefit from a regimen they are unable to handle. The age, strength, maturity and weight of the young athlete must be considered in the construction of a plyometric program.

- Good technique and an understanding of plyometrics in general are crucial. A coach should carefully explain the concept of plyometrics to the athletes before they begin. Athletes should know what the plyometric exercise will do to and for their bodies and how it will make them better athletes. A coach should then explain the proper execution of an exercise while the coach or an experienced team member demonstrates the exercise's proper execution.

- Plyometric drills should always be done on a soft, level surface such as grass or padded mats. Concrete, asphalt, or the running track are poor surfaces for such training. Drills should also be done in supportive shoes with good cushioning. Track spikes and throwing shoes should not be worn.

- Extra weight, such as ankle weights or weighted vests, should never be used. The aim of plyometrics is to be more explosive. Gravity and speed provide the necessary resistance. Adding weight ruins the plyometric effect by causing the athlete to spend more time on the ground and converts the exercise into a form of conventional strength training.
- Athletes should begin with general exercises at low intensity. Some athletes will take a long time to move on to more advanced, specific plyometrics. Some athletes may never get beyond the most general stage.

  As a rule, depth jumps (jumps done after dropping from an elevated surface) are discouraged for high school athletes. If any jumping is done from boxes it should be done only at very low heights (12–18 inches) by stronger and more mature athletes.

Constructing a Plyometric Training Program

When integrating plyometrics into the overall training program, it is necessary to assess the fitness of the individuals and the events in which they participate. The periodization of plyometric training throughout the season and from year to year should also be considered. To do this, a coach needs to understand the different types of plyometric exercises and their specific functions.

TYPES OF PLYOMETRIC EXERCISES

There are three general types of plyometric exercises: rhythm, power and speed. Each form develops different qualities of the neuromuscular system. As such, some exercises are better suited for different events. Conversely, some events are served well by all three types of drills.

Rhythm Plyometrics

Rhythm plyometrics help develop the coordinated movement skills required in track and field. Their primary purpose is to give the athlete greater kinesthetic awareness or body sense, coordination and rhythm. They promote general athletic ability. All track and field athletes benefit from these drills, but they are especially well-suited for less mature athletes and those without good natural skills. For example, many young distance runners have undeveloped strength, rhythm and coordination. For them, the greatest contribution of plyometric drills is to increase their coordination and sense of rhythm. Many young athletes have good ability but simply lack some basic movement skills because they are growing rapidly.

Rhythm plyometrics are quite useful in developing correct running mechanics. More important, these drills give the young athlete an improved sense of physical awareness – how his or her body moves through space. This applies to all athletes. Rhythm drills for sprinters and hurdlers are crucial to optimal success. Sprinting and hurdling are events where speed and power are expressed through proper technique and rhythm.

Jumpers, too, need rhythm plyometrics. Jumping events involve an explosive movement at the end of a controlled run-up. A smooth rhythm enables the athlete to convert run-up speed into the jump. Even high school throwers need rhythm and coordination. The discus is an event of smooth rhythmic motion building to an explosive release. And shot putters need to have a sense of rhythm with the feet in order to move across the throwing circle and land in a solid power position.

Rhythm plyometric exercises also serve as a bit of physical education. As funding and support for physical education curricula have eroded, many young high school athletes come to sports programs with poor coordination, movement skills and basic strength. This fact is particularly applicable to a track and field team, which usually has greater numbers and variety than most other school sports teams.

Rhythm plyometric drills are mostly simple movements done repeatedly. Generally, they involve segments of the movements athletes use while running, jumping, or throwing. Some common rhythm drills are skipping, running with high knee lift, running butt kicks, fast feet running and cariocas. (A fuller description of these drills and their execution appears later.) These drills develop the necessary technique and coordination to let speed and power be expressed most efficiently.

Power Plyometrics

The primary goal of plyometric training is to increase power. The track and field athletes that need to stress power development most are jumpers and throwers, so their training should utilize a large number of plyometric drills. Throwers should use power plyometrics for the upper body as well as the lower body.

Although athletes in all events should use power drills in their training at different points in the season, a coach must bear in mind that power movements are physically demanding. Sufficient rest is mandatory both within and between workouts. During the most competitive part of the season, these exercises should be tapered down. Power exercises for distance runners need to be closely monitored to avoid overtraining during high volume periods.

Power plyometrics emphasize the simultaneous application of maximum strength and quickness. The focus of movement is explosiveness. When doing jump repetitions, for example, the objective is to perform a set of jumps at high intensity, not to continue repetitions past the point of fatigue. Although plyometric training can be used for such purposes, the goal of power drills is not endurance. Explosiveness is greatest when the muscle is warmed and rested. Athletes should only do a given exercise to the point where performance declines. It is better to do an extra set of an exercise than to add repetitions that are not done powerfully. Power plyometric drills include a variety of jumping movements — hops, bounds, single jumps and leaps. Upper body exercises include medicine ball throws, pendulum throws and push-ups. Depth jumps and box jumps are advanced plyometrics, but they are risky for most high school athletes.

Speed Plyometrics

Speed plyometrics emphasize the speed component of training. The overload principle is satisfied in the form of increased speed rather than force. In other words, movements are performed significantly faster than normal. The objective of speed-assisted, or overspeed, training is to force the neuromuscular system to respond more quickly to a stimulus. The accelerated time frame of the action overloads the system, creating faster than normal response. This training effect then carries over into increased event speed.

Speed exercises obviously apply to sprint and hurdle events. Maximizing running speed is the key to success in these events. Jumpers, too, rely heavily on sprint speed, most notably long jumpers and pole vaulters. Throwers benefit from speed training through improvements in general quickness. Speed plyometrics for distance runners are beneficial, but one should remember to coach them to be fast distance runners, not sprinters. The focus should be running mechanics as opposed to sprint speed. Many of these drills will be the same as those done for rhythmic development, stressing maximum quickness. Fast skips, arm swings and butt kicks are a few examples.

Using Plyometrics for Power Endurance

Although the primary goal of plyometrics is to develop explosiveness, athletes also gain by training for power-endurance. Long sprinters and those who compete in multiple events need to develop the capacity to be explosive repeatedly; furthermore, all athletes gain from building a foundation of strength and sub-maximal power. Such preparation prevents injuries and allows for greater intensity and quality in training.

Generally, power plyometrics should be performed with four to eight repetitions at maximal effort. Exceeding that number diminishes the specificity of the exercise for explosiveness. With a greater number of repetitions, however, a power-endurance effect is achieved. It is not too unlike speed-endurance running for sprinters and middle distance runners. Where sprinters train to maintain speed over distance, athletes can also train to be powerful over time. Repetitions from eight to 20 or more and distances from 40 to 150m fall in the *endurance* category.

There are other benefits gained from the use of plyometrics for power-endurance. Multiple repetitions of low stress exercises often serve as a good introduction to plyometric training. Young athletes can learn the jumping movements and techniques more easily when they can focus solely on the movement without having to concentrate on the explosive element. The conditioning effect of these multiple repetitions also builds strength in athletes and prevents injury as the intensity of the exercise increases. Finally, as a practical consideration for the high school coach, plyometrics for power-endurance require somewhat less supervision to accommodate a fairly large team.

DESCRIPTION OF INDIVIDUAL PLYOMETRIC EXERCISES

As with any training program, there is no single regimen of plyometric exercises that will guarantee optimum performance from athletes. The particular exercise is often much less important than how it is executed. In fact, many exercises can be made plyometric. Many coaches will discover a drill that seems especially well suited to their athletes, facilities and environment. The following listing and description of various plyometric exercises is not intended to be all-inclusive. These drills are strongly recommended and should be more than adequate for high school athletes.

Rhythm Plyometrics Drills

- Rhythm skipping
- High knee running
- Butt kicks
- Jumping rope
- Ankle bounces
- Skipping kicks

• Running kicks
• Cariocas
• Crossover steps
• Rhythm bounds
• Rhythm jumping
• Rhythm jump run-ups

(See illustrations.)

Skipping. Skipping is the one plyometric movement that most youngsters probably have done throughout their lives. It incorporates coordinated movement with quickness and bounding. Done properly, skipping develops good running mechanics. Basic running positions and movements are executed and exaggerated in a slower motion. This helps the athlete gain a greater sense of correct body position and action.

As with most plyometric drills, skipping incorporates a wide range of muscle groups. The muscles of the hips and legs do most of the work. The exercise is very effective in developing strength in the hip flexors, ankles, buttocks, calves, hamstrings and quadriceps. Skipping is highly recommended as a fundamental and enduring component of all plyometric programs. In early stages of training, skipping should account for a large portion of the total workload. Later, it can serve as warm-up or warm-down and to reinforce proper mechanics.

Sets and Repetitions: It is best to judge the volume of a plyometric workout by "contacts" (how many times an athlete touches the ground) rather than distance. In other words, if an athlete hops ten times—that is ten contacts regardless of the distance covered. The number of contacts, or repetitions, for a given exercise must be determined in relation to the total workload given to the athlete. This applies to all plyometric exercises. Guidelines for constructing a full plyometric training program will be discussed later in this chapter.

The relatively low intensity of rhythm plyometrics allows a greater number of repetitions (contacts). This is particularly useful in developing the mechanics and body awareness that track and field athletes need.

Rhythm skipping should generally be performed over distances from 70–120 meters to develop power-endurance and strengthen the important ankle and hip flexor muscles. The number of sets performed will vary according to the number of other exercises to be done. The number of sets will also vary according to the abilities of the individual athlete. For rhythm development alone, two to four sets of the above distance are recommended.

Swing Skipping. Swing skipping is a variation of rhythm skipping, the only difference being the arm movement. Instead of maintaining a running posture, the arms are loosely extended and swung vigorously with each skip. This modification combines relaxation with rhythm and serves as a loosening exercise in warm-ups or warm-downs.

High Knee Running. Many athletes and coaches use high knee running or running in place in their training. The drill reinforces good running form and especially strengthens the hip flexor muscles by stressing a high knee lift action. This drill is especially useful for sprinters and jumpers. Attention must be paid to technique. Athletes should never be allowed to lean backwards from the waist in order to facilitate raising the knees. When good technique deteriorates, the exercise loses effectiveness and should be ended.

Sets and Repetitions: For rhythm development, distances of 20–40 meters or 8–12 seconds duration in two to three sets are recommended. For strength and endurance, the drill can be done over 60–100 meters.

Butt Kicks. This exercise is also familiar to many coaches. It strengthens the hamstring muscles and develops quickness and coordination in the recovery phase of the running stride. The drill also requires coordinating leg action with technically correct continuous arm motion. The exercise is extremely useful in developing coordinated running mechanics.

Sets and Repetitions: As a rhythm drill, two to three sets of 30–50 meters are recommended. A walk-back rest is usually sufficient between sets.

Ankle Bounces and Jumping Rope. Both exercises strengthen the ankles and calves. The muscles, tendons and ligaments of the ankle are often too weak for the demands of track and field events.

Every contact with the ground is transferred through the ankles. The ability of the ankle and lower leg to respond quickly and strongly is crucial to optimum performance.

Sets and Repetitions: For beginners and young athletes, no more than 10 meters or 25 repetitions should be covered in one set. Over time this amount may be increased to 15–20 meters or approximately 40 repetitions. Two to three sets are recommended. Rest should approximately be two minutes between sets.

Skipping Kicks. Skipping kicks (Fig. 5-1) add some complexity to rhythm plyometrics. They are excellent for building coordination and rhythm. Hurdlers especially benefit from this exercise. Skip kicks strengthen the hip flexors, quadriceps and hamstring muscles. Most importantly, skip kicks develop coordination of multiple quick movements.

Sets and Repetitions: This drill can be difficult for some athletes to learn. They should start with short distances, concentrating on proper coordination of movement. When the athletes can do skip kicks easily, it shows they really are developing rhythm skills. Eventually each set should cover 40–50 meters. Two to three sets are sufficient. Hurdlers may want to include extra sets as part of their specific preparation for a hurdle workout.

Crossover Stepping. Crossover stepping is a more advanced drill. It builds rhythm and coordination while moving sideways. This is particularly helpful to throwers who need to develop body awareness in multiple positions. The exercise works the muscles of the hip and groin areas and lower legs. It is a good strengthening activity for all athletes.

Sets and Repetitions: Sets should be done over a distance of 40–50 meters. A total of four sets is recommended, alternating the crossover leg. The athlete should maintain a smooth, bouncy rhythm rather than emphasizing speed.

Cariocas. Cariocas (Fig. 5-2) are a more complicated form of crossover stepping. They require a good deal of coordination and rhythm from the athlete and are excellent for teaching relaxed complex movement.

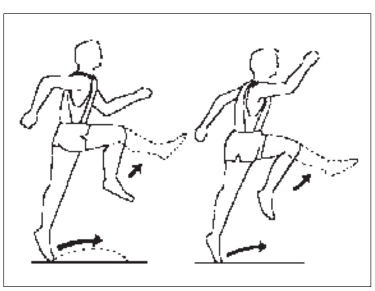


Fig. 5-1. Skipping Kicks.

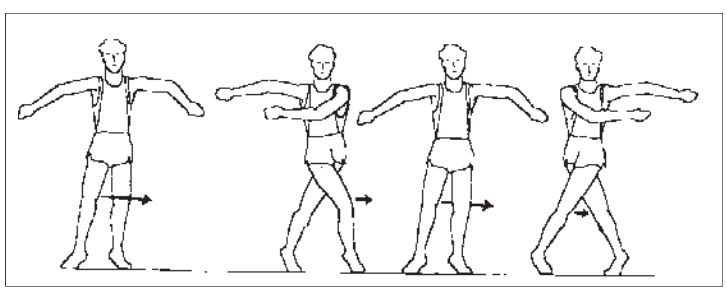


Fig. 5-2. Cariocas.

Sets and Repetitions: Sets and distances covered should be the same as for crossover stepping.

Rhythm Bounds. This bounding exercise of relatively low intensity emphasizes proper rhythm and form rather than power or speed. Coaches should teach this type of bounding before moving to power or speed bounds. The low intensity of rhythm bounds allows for a greater number of repetitions, so younger and weaker athletes can learn and gain strength with a far less chance of injury. Younger athletes should become proficient in these bounds before moving on to more advanced and demanding bounds and jumps. Rhythm bounds can also be used for power-endurance purposes. They are an excellent form of dynamic strength training for distance runners. Bounds develop a wide range of muscles in the legs and hips. They are quite specific to the physical demands of track and field.

Sets and Repetitions: Beginners and less developed athletes should start with two or three sets of approximately 50 meters. With progress, 70–100 meters can be covered. A walk-back of the same distance or a two to three minute rest is advisable. If done for power endurance purposes, the rest interval can be shortened a little. Coaches should be closely monitoring to ensure that athletes maintain proper rhythm and technique. When either starts to deteriorate, the drill should be ended.

Rhythm Run-Ups and Jumps. Rhythm run-ups and jumps are the most specialized of the rhythm plyometric drills. They teach the technique and rhythm required in the jumping events. The athlete learns and reinforces the patterns and motions of the event without the physical demands of executing a full jump. These exercises are excellent means of teaching the younger and less developed athletes on the team.

Sets and Repetitions: With both run-ups and jumps, 5–10 repetitions with three to five minutes rest is recommended. This is not an endurance drill. A good rest will allow the athlete to be fresh and smooth for each repetition.

POWER PLYOMETRIC DRILLS

A Note on Power Plyometric Drills. Power exercises are the bulk of what is commonly called plyometrics. They involve explosive movement with high levels of intensity and effort. When introducing power drills to athletes, the coach must take great care to avoid injury. This is especially true with younger and less developed athletes. Coaches should not force athletes to do power exercises they cannot technically perform correctly.

Two general guidelines apply when determining the fitness of an athlete for a particular exercise. One, the athlete should be able to perform the drill properly as a rhythm drill first. Two, the athlete should be able to maintain correct technique when the drill is performed as a power exercise. Improper execution is a strong signal the athlete is not yet prepared for a given power plyometric exercise.

Lower Body

- Double and single leg hops
- Power skipping
- Power bounds
- Hurdle hops
- Standing triple jumps
- Box jumps
- Single jumps

Double Leg Hops. The double leg hop is an excellent general plyometric exercise for all athletes. Power and strength are developed in the muscle groups of the legs and hips, and specifically, in the quadriceps, gluteals, hamstrings and gastrocnemius.

Slight modifications make the exercise more specific to given events. With beginning and younger athletes, it is best to begin these hop drills by using a small hop between each full hop. This permits the athlete to make any necessary adjustments preparatory to the next full hop. Those with poorer rhythmic and power skills will find this a helpful introduction to power plyometrics.

Sets and Repetitions: Depending on the fitness level of the athlete, two to five sets of repetitions are recommended. When the height of the hops drops off or technique erodes, the set or drill should be terminated. About two minutes rest between sets should be sufficient.

Single Leg Hops. Single leg hops are identical to double leg hops except they are done on one leg. These jumps develop leg strength with the added elements of isolation and balance. They are physically demanding, however. Only athletes with good basic strength should attempt single leg hops. It is recommended that double leg hops

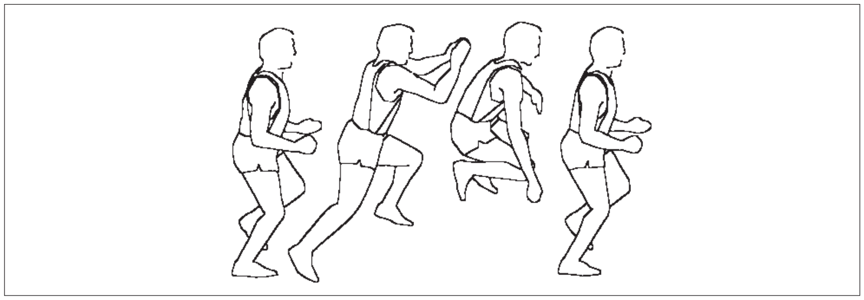


Fig. 5-3. Single Leg Hops.

be done for a condiderable period of time before an athlete attempts to try single jumps (Fig. 5-3).

Sets and Repetitions: Because of the demanding nature of single leg jumping, fewer repetitions and sets than double leg hops should be done. Two to three sets of 6–12 hops are recommended. Increases in intensity should be gradual.

Single Jumps. Single jumps stress maximum effort in a single repetition. They allow the athlete to work at maximum intensity without worrying about further repetitions. They are also a good introduction to power drills. Single jumps can be done both for distance and height. They require athletes to concentrate on a single explosive movement and also force them to generate power without the benefit of momentum. Sprinters, jumpers and throwers all benefit from single jumps because they all begin their events from stationary positions. Jumpers, while using run-ups, need the ability to consciously *explode* at a precise moment. Single jumps should be done into a soft or cushioned landing area.

Sets and Repetitions: One set of four to six jumps is recommended. Single jumps should be done at the beginning of power plyometric work. A rest of 30–45 seconds should be taken between jumps.

Power Skipping. Power skips are exactly what the name implies: skipping done with a deliberate effort to be powerful off the ground. The muscle groups affected are the same as with rhythm skipping, but the emphasis is now placed upon vigorous action.

Sets and Repetitions: As intensity increases repetitions and distances decrease. For power skipping, two to four sets of 40–60 meters or 10–15 skips is recommended.

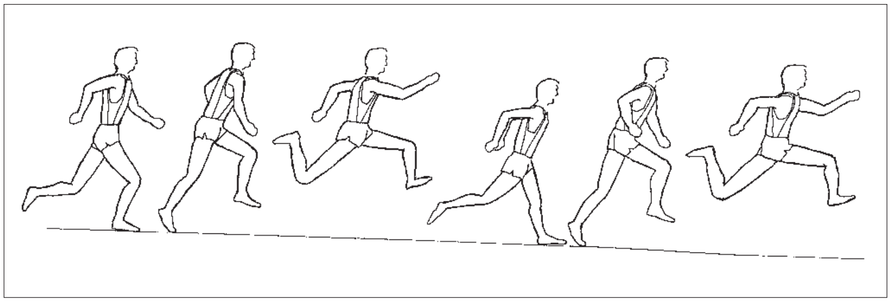


Fig. 5-4. Power Bounds.

Power Bounds. Power bounding (Fig. 5-4) is probably the most common plyometric exercise used by track and field athletes. Bounding closely approximates the running motion and is, therefore, specific in training explosive capacity.

With power bounds, the athlete should land relatively flat-footed. This allows a safe and efficient leap from the same foot. Arm action should be the same as rhythm bounds except for jumpers who may prefer to use double arm action. High jumpers may want to accentuate the vertical component of the bound to make it more specific to their event.

Sets and Repetitions: Power bounding loads will vary substantially depending on the athlete's strength, workload and time of year. The greatest volume of work should occur in pre- and early season. Generally, 8–12 bounds or 30–50 meters at high intensity done in two to four sets is recommended.

Standing Triple Jumps. The standing triple jump is a slightly more advanced drill for developing power and jumping ability. The exercise also develops balance and coordination. Jumpers, specifically triple jumpers and throwers will benefit directly from this exercise. Aside from strength development, the standing triple jump is also an excellent means for testing the jumping ability of athletes.

Sets and Repetitions: The athlete should perform four to six repetitions at strong effort. At least one minute of rest should be given between jumps.

Hurdle Hops. Hurdle hops are double leg hops done over hurdles (or similar barriers). Such hops require a coordinated emphasis on both vertical and horizontal jumping. This exercise is an advanced one and should be undertaken with caution only by sufficiently prepared athletes. The drill is demanding, requiring power,

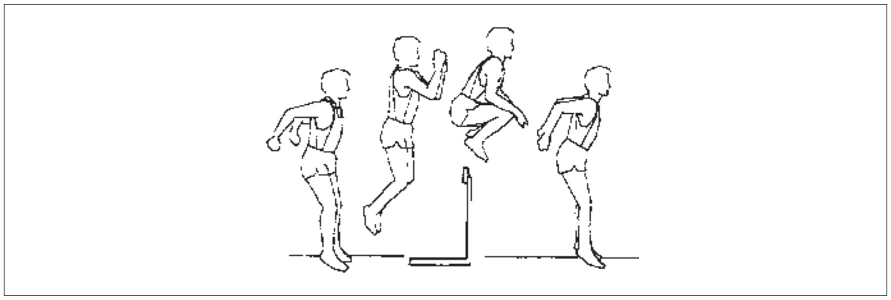


Fig. 5-5. Hurdle Hops.

quickness, good coordination and often some courage. It is excellent training for advanced athletes (Fig. 5-5).

Although an advanced exercise, hurdle hops can be modified so that less capable athletes are able to get similar benefits from the drill. One can turn the hurdles upside down or use other low barriers such as cardboard boxes. However, double leg hops should be sufficient for those not ready for hurdle barriers.

Sets and Repetitions: Four to six sets over five hurdles are recommended.

Box Jumps. Box jumps, also referred to as depth jumps, are the most advanced of the power plyometric exercises. As a general rule, box jumps are not recommended for high school athletes. This exercise is most strenuous, and injuries can occur quite easily to those without proper physical and technical preparation. Box jumps are discussed here primarily for the purpose of educating the coach. Of course, athletes of exceptional strength and maturity do appear at the high school level, and they may benefit from such drills. However, the coach must not assume that a highly talented individual is ready for such training. A season can be ruined quickly this way. Furthermore, especially with high school age athletes, when one member of the team is seen doing box drills, others who are not prepared will usually want to attempt the same thing. For these reasons, box drills are discouraged for high school track and field programs.

Upper Body

- Power push-ups
- Wheelbarrow walks
- Medicine ball throws
- Twist tosses

Power Push-Ups. Push-ups are a common callisthenic exercise with which most people are familiar. Push-ups strengthen a wide range of muscles in the upper body. The power push-up is a variation of the common push-up emphasizing a strong, quick push off the ground causing the hands to actually leave the ground after the push. This exercise is most specific to throwers and vaulters, but helps sprinters as well.

Most high school athletes will need to perform the drill with their knees as a base rather than their feet. Stronger athletes may work from the traditional position. The rate of stretch is more important than the degree of stretch. The exercise should seem almost like bouncing on the hands. The athlete should only lower him or herself to the point where the recovery is quick and powerful.

Sets and Repetitions: Power push-ups will not usually produce the same burn sensation as common push-ups. Nonetheless, they put a great deal of stress on the muscles, tendons and ligaments of the shoulders, elbows and wrists. Two to four sets of 8–12 repetitions is recommended.

Wheelbarrow Walks. This is a version of the same game played by children. Nonetheless, the drill develops shoulder and arm strength along with balance and coordination. The exercise can easily be incorporated into a team stretching or callisthenic session.

Sets and Repetitions: Two to four sets of 10–15 yards is sufficient.

Medicine Ball Throws. The medicine ball is a time honored device for building dynamic upper body strength. The balls come in different weights and sizes to accommodate the different strength levels of athletes. In high schools where weight training access may be limited, this type of exercise provides an excellent substitute. In fact, medicine ball training has long been used by elite athletes in a number of sports. Though more specific to the throws, medicine ball work will benefit athletes in any event. Medicine ball throws (Fig. 5-6) can be done in a variety of ways. They can be performed standing, kneeling, sitting, or even lying on one's back. Throws can also be preceded by a *toss* from another athlete, though with heavy balls take caution to avoid injury. The two types of throws are recommended: the overhead and the push throw.

Sets and Repetitions: The volume of this drill depends on the event specialty of the athlete. Throwers and pole vaulters should use medicine ball throws extensively. Others

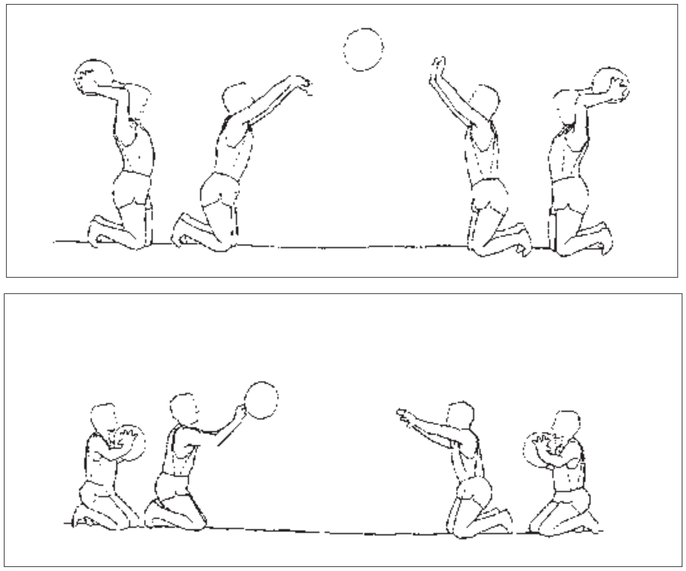


Fig. 5-6. Medicine Ball Throws.

should incorporate throws as part of general strength conditioning. For general purposes, two to four total sets of 8–12 throws is good. Throwers may want to increase the variety of throws and sets. Repetitions should not increase – this is power, not endurance training.

Twist Tosses. These throws (Fig. 5-7) are excellent for throwers and can be done with medicine balls or shots. They develop strength in the trunk and the shoulder muscles that are used in rotating the body during a throw.

Sets and Repetitions: Coaches should make certain athletes start slowly with a properly weighted ball. The ball should not be so heavy that fluid and powerful movement is inhibited, nor so light that the trunk muscles are not worked sufficiently. Athletes should not rush into hard throws as injury can result. Two to three sets from each side with 6–12 repetitions is good.

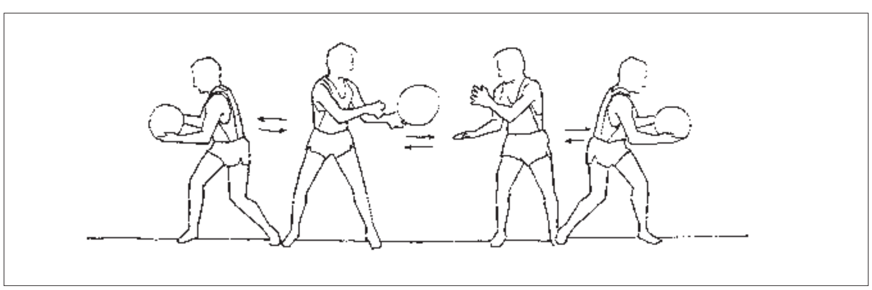


Fig. 5-7. Twist Tosses.

Speed Plyometric Drills

Speed plyometric exercises are specific to the development of speed. The overload mechanism is not increased weight or gravity, but, rather, a shortening of the time in which the movement occurs. Where power drills rely heavily on the strength aspect of plyometric training, speed drills stress velocity. By doing so, the neuromuscular system trains to perform at greater speed. Speed is the essence of track and field.

Speed-Rhythm Drills. With emphasis on quickness, several of the rhythm exercises become speed drills. High knee running, butt kicks and skips are easily adapted. The athletes should maintain the same posture and mechanics as with the rhythm forms of the drills.

The high knee drill is still focused on driving the knees up but the key is increased turnover; therefore, the knees and arms will only have a ½ to 2/3 range of motion.

Butt kicks are done the same as in the rhythm series with an emphasis on rapid turnover. Skips are done normally but purely for speed, not distance. In fact, these skips will almost appear as a quick shuffle.

Sets and Repetitions: Though the number of sets remains similar to rhythm drills, the distance shortens considerably. These exercises should be done over 10–15 meters in two to three sets each.

Fast Hands/Quick Feet. In this drill, the aim is to move the hands and feet as fast as possible. Technique is less important here. The idea is to turn over as rapidly as the body allows. Little forward movement will actually occur.

Sets and Repetitions: Two to four sets of 5–10 seconds.

In-Place Arms. This is a speed-technique drill. It helps sprinters train for rapid arm drive while maintaining good mechanics. While standing in place, the athlete drives the arms with good sprint form as quickly as possible.

Sets and Repetitions: Two to four sets of 10 seconds.

Speed Bounding and Hopping. These speed plyometric exercises combine speed with an element of power. Such exercises can help all athletes but especially those in speed and power events. These bounds and hops can also be done in assisted fashion by using some type of elastic mechanism.

Speed bounding and hopping are done in the same basic manner as power bounds and hops; however, the emphasis is on covering the overall distance quickly rather than achieving maximum distance in a single bound or hop. Essentially, one is performing a bounding or hopping sprint. Instead of attempting to gain maximum height or distance, the athlete aims to move as quickly as possible. To assist, the athlete should visualize a kangaroo for power drills and a rabbit for speed drills.

Sets and Repetitions: For bounds, perform three to six repetitions of distances from 40 to 70 meters with good recovery. With hops, two to five sets of 10–20 meters with rest are recommended.

Lightweight Pendulum Throws. This is a drill for throwers. Using a lightweight ball securely suspended to create a pendulum, the thrower reacts to the ball being swung into his hand, immediately responding with the throwing motion. The exercise helps develop quickness in the throwing delivery, stressing hip and arm impulse.

Sets and Repetitions: Ten to 15 repetitions with 30–60 seconds' rest are sufficient.

Downhill Running. Running on a slight downhill grade of two to three degrees is excellent for honing sprint speed. The effect of gravity forces the neuromuscular system to respond faster than normal. Such running is usually done at a time in the season where peak speed development is appropriate. On a slight downhill grade, 5–10 sprints of 40–80 meters are recommended. Attention should be given to proper sprint technique. Athletes will often begin to overstride and brake their run. This should be avoided.

Assisted Sprint Runs. Sprint-assisted training is an effective method of developing speed which lets the athlete run faster than possible under his or her own power. Several products exist for this type of training. Usually, the athlete is attached by harness or belt to a large elastic cord. Thick rubber tubing is also often used. With the tubing stretched, the runner sprints a given distance. Tension in the mechanism pulls the athlete faster than he or she would sprint unassisted, training the body to move at greater speed. As with downhill running, the overload principle is satisfied by reducing the time period in which the sprinting motion must be completed. This form of training is specific to sprinters and jumpers and not particularly recommended for long distance runners.

Assisted sprinting should be done on the track or a good, level field. With the device secure and at tension, the athlete performs a sprint. Proper sprinting mechanics are essential. The tension should not be so great that the athlete loses good technique or control or needs to brake with each stride. If he or she does so, the tension on the pulling cable should be reduced. For best results, another athlete should run with the tubing or cord at the same time as the first athlete sprints. Doing this allows for more constant degree of tension throughout the drill. (For example, in a 60-meter assisted sprint, the second athlete stands with a 20-meter cord stretched another 15–20 meters. As the sprinter begins, the second athlete runs quickly past the 60-meter mark.)

Sets and Repetitions: In a single workout, four to six repetitions of 40–70 meters with full recovery is recommended. This is a pure speed exercise, so the athlete should be fresh for all repetitions of the drill.

Note: **Some forms of sprint-assisted training can be dangerous, especially being towed by a vehicle. Athletes should always have enough control over the drill that they may stop it at any time. To do otherwise, subjects them to a significant risk of injury.**

Incorporating Plyometric Training

The key to successful use of plyometric training is a carefully planned and supervised program that is properly integrated into the overall training. Plyometric exercise is actually a method of training, not simply a set of drills. The way these drills are performed determines their benefit to the athlete. The general and specific principles of training mentioned earlier must guide the structure of the training. Coaches should pay specific attention to the concepts of gradual progression, recovery and individuality; furthermore, they should always be aware that they are training the capacity for explosive power. Finally, the rate of stretch of the muscle is more important than the degree of stretch.

INTRODUCING PLYOMETRICS

The foundation of any plyometric regimen is proper instruction. Coaches must explain underlying principles and teach the methods of training correctly. Plyometric training is not mysterious. Here are some simple guidelines:

1. Be familiar with plyometric principles.

2. Begin slowly. Rhythm drills are more easily learned for most athletes.

3. Progress gradually to avoid injury. Rhythm drills are less demanding.

4. Always emphasize quick movement off the ground. The athlete should never *settle* into a jump or throw. Stress the concept of *bouncing* (like kangaroos and rabbits).

5. Ensure proper technique at all times. Good technical execution is a good indicator of an athlete's capacity for a given drill.

6. Stop a given drill or workout when fatigue becomes apparent. Plyometric exercise is deceptively demanding. The goal is not to exhaust the athlete.
   Here are a few indicators to identify performance fatigue:
   - Reduced height or distance
   - Reduced range of motion
   - Poor upper body position (i.e., bending over)
   - Loss of coordination

VOLUME AND INTENSITY

A good plyometric regimen combines proper technique instruction with the appropriate volume and intensity of the drills. Physical maturity, fitness, propensity to injury, and event specialities are different for each athlete. In high school, especially, the physical maturity of athletes varies widely. A coach could find he or she may be working with an 18-year-old senior boy while at the same time working with a 14-year-old freshman girl in the same event. Coaches should always error on the side of caution.

The volume and intensity of a plyometric session must also be determined in light of other training. The nature of plyometric exercises demands they be included as part of the body of a workout, not merely as warm-up or drills. Combining a hard power plyometric session with fast sprint repeats, for example, will most likely exhaust, overtrain, and even injure the athletes.

Periodization and event specialities also determine the volume and intensity of a session. Volume is higher in preseason and early season training. As the season progresses, volume moderates and intensity increases. Eventually, plyometrics are sharply reduced during the peak competitive phase of the season. This formula is shaped, though, by event demands. Sprinters, jumpers and especially throwers will perform a good deal more plyometric work than distance runners. Generally, two sessions per week are recommended. In especially heavy periods of training or competition, one session may be adequate.

Factors shaping volume and intensity in plyometrics include:
- Individual physical capacity and fitness
- Other training in a given workout
- Event differences
- Phase of training

Ranges of Volume and Intensity

So what are the ranges of volume and intensity? A plyometric session should normally be completed in 15–30 minutes' time, sometimes less. Sufficient volume can usually be performed in this amount of time.

Volume is determined by the number of repetitions performed; that is, contacts with the ground. If bounding 50 meters results in 15 bounds, that means 15 contacts. For beginners, contacts may range from a low of 15–30 contacts. As fitness increases, 80–100 contacts are generally performed in a power plyometric session. For endurance purposes, 150–225 contacts is an acceptable range. Rhythm and speed plyometrics are less easily quantified. Let time and contacts serve as a rough guide to ensure appropriate workload.

Intensity is determined by the type of plyometric drill performed. Rhythm drills are of relatively low intensity. Power and speed exercises are high intensity. At the beginning of every season, a moderate introductory phase will serve as a safe means of beginning a plyometric program. Gradually increase intensity to the athletes' capabilities and event needs. Eventually, power and speed athletes need to train at full intensity to gain the most from plyometric exercise. For this reason the number of repetitions in any single set or performance is relatively low for power drills. Research shows that power output drops drastically after 8–10 repetitions. For the jumps and throws, the goal is to maximize the application of power in a single moment. For those athletes, especially, tremendous power and intensity over two to three repetitions is much more important than possessing fair power and intensity over 10–15 repetitions.

SPECIFICITY

As a fundamental principle of athletic training, coaches must train their athletes for particular events, helping them develop skills and capacities specific to those events. Accordingly, plyometric regimens will differ according to event specialities; however, many high school athletes compete in a wide range of events. For these athletes, a program of general exercises with specificity added during peak competitive periods is suggested.

PERIODIZATION AND PHASE TRANSITION

Plyometric training needs to be carefully periodized over the course of the season (and even an athlete's career) to achieve maximum benefit and avoid injury. The volume (or number of contacts) and intensity needs to be monitored. Progression from general to specific exercises occurs as fitness increases and individual event requirements are addressed. During peak competition periods, plyometric work eases to maximize recovery.

Perhaps the most important aspect in periodizing plyometric training is deciding when to implement a certain type of exercise in the training program. Intense hopping and bounding too early or too close to important competitions can easily ruin a promising season.

Introducing Plyometrics

Begin each season with an easy introduction to plyometric training. Even experienced athletes should start with general exercises using a moderate number of repetitions performed at low intensity. In a high school program, a lot of teaching has to be done during this phase of training. New mechanics need to be learned, and new neuromuscular adaptation has to occur. Many athletes will have never performed plyometric exercises. Coaches should resist the temptation to move better athletes on to more intense drills too soon. Doing general exercises with excellent technique and developing greater strength in tendons and ligaments is far more beneficial than rushing into demanding drills. The teaching phase should emphasize rhythm drills. Lower intensity and more repetitions afford a good opportunity for learning plyometric exercise with proper technique and execution.

Plyometric work should be done after the main body of running, throwing, or jumping. The athletes will be warmed up and loose, and the fatigue of plyometric training will not compromise the event-specific portion of the workout; however, that does not mean plyometric work should ever be done as part of a warm-down. It is part of the training, not the end (or beginning) of it.

Teaching and General Skill Development

The introduction phase begins with two easy sessions in the first one or two weeks. Next, athletes should progress to the same drills with slightly greater volume. As strength and skill develop among athletes, introduce some power plyometrics. A good place to start is with skips and bounds. When athletes have learned these properly in rhythm form, they should begin doing drills with greater intensity, bringing in the power component. At the end of this three to four week phase, one session should be primarily rhythm plyometrics and the other power plyometrics. With transition to the next phase of training, event specificity determines the nature of plyometric workouts.

General Power Development

The next phase of training is to divides the team according to event areas. The development of specific capacities now begins. Power plyometrics are stressed in this period. Sprinters stress power and begin to incorporate a greater percentage of speed plyometric work near the end of the phase. Jumpers and throwers build greater volume and intensity into the power work and move toward more event/specific drills. Distance runners do moderate amounts of power work combined with rhythm work accentuating fluidity and speed. Multi-event athletes should follow a course similar to that of jumpers or sprinters. This period of development will cover two to four weeks, or 20 percent of the season for one hard and one easy session per week. The greatest volume will be done at this time.

Specific Power and Speed Development

The third phase of the season's plyometric training is the most complex and intense. All three types of drills are combined with an increase in volume and intensity. Two strong sessions per week with at least two full days rest between them are recommended. Additional sessions are likely to lead to overtraining and injury. During this period, sprinters now integrate rhythm, power and speed plyometric exercises. Emphasis is placed upon power development early in this phase, and then the focus moves to speed plyometrics. Jumpers and throwers continue to stress power development, integrating event-specific rhythm and speed drills. For these athletes, specificity in power plyometrics is the key. By the end of this phase, intensity reaches its peak. Athletes should aim for maximum efforts.

Distance runners should maintain a low level of power work, stressing rhythm and speed development instead. These athletes need to train as distance runners, not sprinters. Coaches should stress rhythm and speed, not power and speed. The intensity of workouts will be moderate. This period of training will last four to five weeks, or 30 percent of the season. Plyometric activity should be adjusted according to the team's competition schedule.

Optimum Performance and Recovery

The fourth and last phase of plyometric training accompanies the peak competitive portion of the season. Volume is drastically reduced, usually to one very moderate session per week. Intensity is maintained but not to a degree that overstresses the athlete. Optimum performance with plentiful recovery is crucial at this time. In the last week or two before major competition, any hard plyometric work ends. Some authorities suggest stopping all plyometric work; however, it is recommended that light plyometric activity reinforces the early training of the neuromuscular system. Drills should be event specific with rhythm and speed as the focus. (Only jumpers and throwers need to incorporate any power oriented activity at very low volume and moderate intensity once per week.)

REST AND RECOVERY

Many coaches fail to view rest as an integral part of successful training. In a well constructed program, rest is not the absence of training, but a component of it. Benefiting from plyometric exercise requires a thorough understanding of this principle. Because plyometric training is demanding and stressful, coaches should always lean on the side of caution. Overtraining with plyometrics will leave a coach with sore and exhausted athletes. Coaches should schedule at least 48 hours, and preferably 72 hours, between sessions. A maximum of two plyometric workouts per week are recommended, although some plyometric activity such as rhythm drills can be part of daily workouts. As the season nears its climax, plyometric training should be curtailed.

CONSTRUCTING A SINGLE TRAINING SESSION

While periodization is the strategic planning of training, constructing an individual workout is the tactical planning. Great planning is worth little without constant attention and adaptation by the coach. A conservative, cautious, and supervised regimen is the best guarantee of successful plyometric training. The best plyometric program is one that works for the individual athlete within the context of the team's overall training. Plyometrics must be balanced against the volume and intensity of running, throwing, jumping and weightlifting. There is no best single workout. Variation and adaptation are important.

In constructing individual workouts, coaches should always be aware of the number of contacts to be performed. This number varies according to the phase of training and the fitness of the athlete. Coaches should not simply assume that talented athletes can do a large volume of work without negative effects. Athletes should start with low volume and low intensity, and build accordingly. Although plyometric training is usually done after the main body of the day's training, this is not always so. Sometimes rhythm and speed drills might be done before running with power work done after. Jumpers and throwers should do any technique work before plyometrics. Often, plyometric drills will be the main body of training for these athletes. With distance runners, reduce the vertical component of the drills and perform bounds and hops on separate days and vary the drills from session to session.

Usually, the first session of the training week should be the more strenuous of the two. The second session can be less demanding. Using different drills provides variability and generates greater interest among the athletes. Coaches need to be creative and flexible.

Within the workout athletes should do rhythm drills first followed by speed work, and then power work. Power drills should be done last because they are the most exhausting. There should always be sufficient rest between repetitions and sets. Plyometric workouts should not generally be endurance workouts. The intent is to develop explosiveness.

PERIODIZATION OF PLYOMETRIC TRAINING FOR THE HIGH SCHOOL SEASON

Event	Phase I:	Phase II:
	TEACHING & GENERAL SKILLS DEVELOPMENT (2–4 weeks)	GENERAL POWER DEVELOPMENT (2–4 weeks)
Sprints and Hurdles	general plyometric strength and skill development for all athletes Gradually build to moderate volume Low intensity Increasing volume and intensity Composition primarily rhythm drills Performed after main body of training	
Jumps and Throws	Same as above	Rhythm drills 20% Power drills 60% Speed drills 20%
Middle and Long Distance	Same as above	Rhythm drills 50–40% Power drills 50–50% Speed drills 10% Moderate volume and intensity.

Event	Phase III:	Phase IV:
	SPECIFIC POWER AND SPEED DEVELOPMENT (3–5 weeks)	OPTIMUM PERFORMANCE AND RECOVERY (peak competition)
Sprints and Hurdles	Rhythm drills 20% Power drills 50–20% Speed drills 30–60% Intensity increases Two sessions per week	Peak competition requires an appropriate recovery period Plyometric training reduced to once per week with light activity on other days Low volume Moderate intensity Emphasize rhythm and speed drills
Jumps and Throws	Rhythm drills 25% Power drills 50% Speed drills 25% Moderate volume High intensity Stress event specificity.	Same as above
Middle and Long Distance	Rhythm drills 40–60% Power drills 20% Speed drills 40–20% Moderate volume and intensity.	Same as above

SAMPLE PLYOMETRIC SESSIONS BY TRAINING PHASE

Event	Phase I:		Phase II:	
Sprints and Hurdles	Rhythmskips	4x50m	Swing skips	2x70m
	High knees	2x20m	Single leg hops	2x12
	Butt kicks	2x20m	Double leg hops	2x15
	Skip kicks	2x25m	Fast hands/feet	2x15m
	Rhythm bounds	2x40m	Speed skips	2x40m
Jumps and Throws	same as above		Power skips	2x40m
			High knees	2x20m
			Butt kicks	2x20m
			Power bounds	2x40m
			Standing TJ	5 reps
			Power push-ups	3x10
Middle and Long Distance	same as above		Swing skips	2x70m
			Ankle bounces	3x20 reps
			Power bounds	3x40m
			Speed skips	2x40m

Event	Phase III:		Phase IV:	
Sprints and Hurdles	Speed rhythm drills	3x20m each	Rhythm skips	2x70m
			Speed bounds	3x50m
	Power skips	2x50m	Assisted sprint runs	4x60m
	Standing LJ	5 reps		
	Speed bounds	3x50m		
Jumps and Throws	Swing skips	2x50m	Speed rhythm	2x20m each
Power Bounds	3x50m	Power Skips	3x40m	
	Standing TJ	6 reps	Rhythm run-ups	6 reps
	Rhythm jumps	8 reps*		
	*Throwers substitute Medicine Ball Throws.			
Middle and Long Distance	Swing skips	2x80m	Swing skips	3x70m
	High knees	2x30m	Rhythm bounds	2x50m
	Butt kicks	2x30m	Skip kicks	2x30m
	Speed hops	3x12 reps		

CHAPTER 6

Injuries: Prevention and Treatment

As a high school coach, you are responsible for the physical and emotional well-being of your athletes. You must be involved in the care and prevention of athletes' injuries, recognize and manage common ailments, and provide emergency treatment when required. You also must constantly be on the lookout for behaviors indicating any of the many serious health problems teenagers face, including substance abuse, teenage pregnancy, and eating disorders.

The Coach's Responsibility

Among the many responsibilities of the high school coach is having a pre-determined plan for the prevention and care of injuries suffered by your athletes. This means taking precautions to prevent injuries, administering emergency first aid, securing prompt professional medical assistance, and recommending subsequent professional medical treatment or physical therapy.

To fulfill this obligation to your athletes you must be able to do the following:

- Recognize common injuries
- Know your responsibility for the management of an injury
- Provide immediate, emergency care

The following is a list of 10 questions that you should be able to answer without hesitation. These questions will also assist you in developing a plan to handle a medical emergency situation should one occur.

- Do you have ready access to your athletes' medical consent cards, which provide parental consent for treatment in case of an emergency?

- Do you keep these cards filed in your first-aid kit? Is your first-aid kit always on hand at your practices and meets?

- Do you know what materials are contained in your first-aid kit and how to use them? Do you have what you need?

- Are you aware of all your athletes' pre-existing medical/physical problems such as diabetes, epilepsy, who wears contact lenses, and who is allergic to bee stings?

- Do you have a cell phone with you at all times or do you know the location of the nearest telephone to summon emergency medical assistance? If the phone is in a locked room, do you have a key or know where to get one quickly? If it is a switchboard phone, do you know how to get an outside line?

- If the nearest phone is a pay phone, do you have quarters taped to the inside of your first-aid kit so you always have change on hand?

- If you are not in a 911 response area, do you know the phone number for the nearest paramedics?

- Do you know the location of the nearest paramedics to your school and their anticipated response time?

- If paramedics have to be summoned, will they find the gates to your track complex locked? Do you have keys for those gates? Do you know where to get a key quickly?
- Do you know the location of the nearest hospital to your school? Is that the hospital to which an ambulance will take an athlete?

The Most Common Injuries

The multi-event nature of track and field poses a particular challenge to a coach trying to prevent and treat athletic injuries because each event presents its own unique problems.

HEAT PROBLEMS

Heat problems can be among the most devastating and serious injuries. Heat cramps, heat exhaustion and heat stroke must be identified and treated quickly and appropriately.

It is important to understand how the body handles excess heat during exercise. During exercise the amount of heat produced by muscular activity exceeds the amount of heat dissipated by the body, so the body's temperature rises. This rise in body temperature causes increased sweating and blood flow to the skin. Heat is dissipated by the evaporation of sweat from the skin to the cooler surrounding of the air.

When the rate at which heat is produced equals the rate at which it evaporates from the body, the body temperature plateaus at that elevated level when the athlete continues to exercise. Trouble begins, however, when the body produces more heat than can be dissipated, causing the body temperature to rise to potentially dangerous levels. High environmental temperatures and humidity increase the danger of heat problems because they inhibit the body's ability to reduce heat.

Heat Cramps

Prolonged heavy sweating and inadequate fluid replacement in hot weather may cause muscle twitching, cramps and spasms in the legs or arms. *Immediate treatment is to remove the athlete from the source of heat by placing him or her in a cool, shaded place to rest – then replace water and electrolytes.*

Heat Exhaustion

As the body temperature rises, these signs indicate the possibility of heat exhaustion: headache, light-headedness, confusion, nausea, vomiting, muscle cramps, cold clammy skin, weak and rapid pulse. *Immediate treatment is to move the athlete to a shaded area, elevate the feet, place cold towels or ice around the neck, head and abdomen, administer fluids as tolerated, and refer to a doctor.*

Heatstroke

This is a medical emergency! Symptoms of heatstroke are a lack of perspiration, hot and dry skin, body temperature elevated to greater than 105-degrees, chills, irrational behavior, involuntary limb movements, seizures, cyanosis (bluish color of the skin), vomiting. **Death may occur unless emergency medical treatment is administered at once!** While waiting for an ambulance, move the athlete to a shaded area, remove clothing and keep the skin moist, place ice on the head and neck. The hospital will need to administer intravenous fluids.

Prevention of Heat Problems

Gradual acclimatization is the key. Most athletes will acclimatize within 5 to 15 days of training in hot, humid weather conditions. Other suggestions:

- Warm-up in the shade when possible. Rest in the shade between events or bouts of training.
- Wear minimal, loose-fitting clothing.
- Drink plenty of fluids during the day prior to training or competing.

INJURY CLASSIFICATIONS

There are two main classifications of athletic injuries: **acute** and **overuse**.

Acute Injuries

An acute injury is the result of a single, sudden trauma. An example of an acute injury would be a long jumper landing with his ankle inverted (turned inward).

Overuse Injuries

An overuse injury is caused by repeated microtrauma. Each small trauma on its own is not enough to cause an injury; however, the sum total effect results in an injury.

These injuries may become chronic. Achilles tendonitis or shinsplints are examples of overuse injuries.

SOFT TISSUE INJURIES

Sprains

Sprains are injuries that occur around a joint, damaging the ligaments that attach bone to bone. Sprains are caused by an overextension of the normal range of motion for that particular joint. The most common cause of ankle sprain is inversion (turning the sole of the foot inward and damaging the ligaments on the outside of the ankle). The extent of the damage to the joint is measured by the amount of trauma caused to the ligament. Sprains are graded as follows to indicate severity:

First-Degree Sprain. The ligaments around the joint are stretched. Symptoms are temporary pain, loss of function, weakness, tenderness at the point of injury and mild swelling. Recovery time: 1–7 days.

Second-Degree Sprain. The ligaments around the joint are partially torn. (Think of the ligament as a rope with some of the fibers torn, but the rope itself is still intact. Symptoms are tenderness over soft tissue, weakness, swelling, discoloration and limited function. Recovery time: 1–4 weeks.

Third-Degree Sprain. This is a complete rupture of one or more ligaments around the joint. Symptoms are constant pain, loss of function, extreme tenderness over ligaments, swelling and discoloration. Recovery: 4–6 weeks (if surgery is required, this is a season-ending injury).

Sprains are generally characterized by swelling, discoloration, temporary or lasting pain and decreased mobility. A phenomenon which frequently occurs immediately after a sprain is numbness, which allows the ankle to be examined easily, but gives an incorrect indication of the severity of the injury. Be cautious about allowing an athlete with a sprain to resume training or competition. Resting that day will be rewarded with an early return to training, rather than by guessing wrong and causing further damage.

The immediate treatment for sprains should be I-C-E — ice, compression and elevation. It is important to refer an athlete with a severe sprain to a health care professional who is familiar with sports injuries.

Return to activity after a severe sprain should be approved by a release from a physician. A strengthening program should be begun prior to a return to training. Exercises should be done which strengthen the muscles on each side of the injured joint. *A functional evaluation* should also be performed. Examples of a functional exam include jogging a figure 8 without limping, running a zigzag pattern without limping when changing directions, and running and coming to a complete two-foot stop without favoring the injured ankle or knee. Athletic taping can reinforce and protect the joint, but it is not a substitute for rehabilitation exercises.

Strains

Strains occur either within a muscle or at the point where the muscle and the tendon join, not at a joint. If an athlete sprains an ankle, the overextension of the muscles surrounding the joint may result in a muscle strain as well as an ankle sprain. If you have ever sprained your ankle and had the muscles on the side of your leg hurt, you probably also strained your peroneal muscles above the ankle. Strains can be caused by one traumatic overextension or by continued overuse.

Strains, like sprains, are classified by severity, as follows:

First-Degree Strain. Muscle fibers are stretched. This is commonly referred to as a **muscle pull**. Symptoms are spasm of the injured muscle, pain upon contraction or stretching and moderate pain to the touch. Recovery time: 2 days to 2 weeks.

Second-Degree Strain. Muscle fibers are stretched and partially torn. (The example of a rope with fibers torn, but still intact, is also good visualization of a muscle tear.) Symptoms are spasm of the injured muscle, weak and painful contraction, pain upon stretching, loss of function, swelling and discoloration (from hemorrhage within the muscle). Recovery time: 3–4 weeks.

Third-Degree Strain. The muscle fibers are torn or possibly completely ruptured. Symptoms are severe pain and muscle spasm, palpable defect (you can actually feel the indentation where the muscle has torn), swelling, discoloration and a partial to total loss of function. Recovery time: 6–8 weeks (this is usually a season-ending injury).

Tendonitis

Tendonitis is an inflammation of a tendon, the tissue structure that attaches muscle to bone. A tendon is covered by a sheath that surrounds it completely. When a tendon is inflamed, the swelling causes it to stick to the sheath instead of sliding smoothly through it. This can be very painful. Tendonitis often starts with simple tenderness over the tendon and progresses to a painful state that restricts movement. In its most severe state, there is painful and sometimes audible **crepitus**. Crepitus is caused by the tendon rubbing against the sheath. To the injured athlete, it feels like two pieces of sandpaper rubbing together. The cause of tendonitis can be an acute trauma or continued overuse.

Acute Tendonitis. This occurs with one sudden overextension of the tendon, which stretches the tendon beyond its normal limits, but does not result in rupture. An example of such an overextension would be a high jumper overextending to hit his takeoff mark, collapsing forward and shifting all his weight to the tendon just below the knee.

Overuse Tendonitis. This occurs with repeated activity that slightly overloads the tendon. The cumulative effect of this repeated overstretching is an inflamed tendon. An example of such repeated overstretching would be the runner who changes his training to include more hill work and experiences pain in his Achilles tendon. If overuse tendonitis is not treated properly and the athlete continues to train without modification, tendonitis may become chronic — a state in which the athlete is never free of the problem.

Treatment of tendonitis consists of reducing the inflammation by resting the tendon, icing the tendon and sometimes by taking an anti-inflammatory medication. Sometimes the problem will require a stronger drug prescribed by a physician. Severe cases of tendonitis often require physical therapy. Rest is a key factor in recovery.

INJURIES BY EVENT

Sprinters and Hurdlers

Upper Leg Muscle Strains. These include strains in the hamstrings (back of the thigh), quadriceps (front of the thigh) and hip flexors (area in the front of the thigh where the leg bends at the hip).

Treatment for upper leg strains is I-C-E, a compression wrap to reduce swelling, and referral to an M.D. if pain persists. Gentle stretching (not forced) can begin 24 hours after a mild strain.

Shinsplints. Shinsplints is a non-specific term for an overuse injury to the lower leg. Pain is usually found in the lower two-thirds of the shin and is associated with tendonitis of the posterior tibial tendon or other flexor tendons along the shin.

Treatment for shinsplints includes I-C-E, taping to support the arch (this takes the pressure off the lower leg tendons, which attach to the foot), and strengthening the muscles of the foot and the lower leg. Increase the strength of the muscles on the front of the lower leg to help balance and absorb landing shock.

An important factor in preventing shinsplints is analysis of the biomechanics of the sufferer's foot. Does it over-rotate? Is the arch unusually flat or high? Do the shoes provide enough support and stabilization? Do they still adequately absorb shock? A training program with a gradual increase in volume and intensity is essential. Shinsplints is usually an early season injury resulting from attempting to do too much too soon!

Achilles Tendonitis. Achilles tendonitis is an inflammation of the tendon that leads from the calf down to the heel. Treatment is I-C-E, rest, placing a heel lift of $1/8$–$1/2$ inch inside the shoe to shorten the stretch of the tendon, and a gradual return to training.

Prevention measures for Achilles tendonitis include daily flexibility exercises for the calf muscles, a strength program for the lower legs to improve balance, and wearing good running shoes that provide support and stability.

I.T. Band Syndrome. The iliotibial band runs along the outside of the thigh and connects at the outside lateral border of the knee. As runners increase the volume and intensity of their training, they frequently develop pain on the outside of the knee that has nothing to do with the knee structure itself but with the attachment of this tendonous band.

Treatment for I.T. band syndrome includes I-C-E and wearing a neoprene knee-sleeve to keep the area warm and compress the tendon.

The best way to prevent I.T. band problems is to employ a daily stretching program as outlined in this coaching manual.

Knee Pain. Patellofemoral pain (pain around the kneecap) often develops directly under the kneecap. Pain is caused by the back of the kneecap rubbing against the end of the femur (thigh bone). This is usually caused by a malalignment (a tilt) of the kneecap. The underside of the kneecap then becomes rough and sometime *catches* as the athlete tries to straighten the leg. You may have heard this problem referred to as **chondromalacia.** Symptoms include pain when running or going down stairs (worse than going up stairs) and difficulty standing and straightening the leg after sitting for a long period. The athlete may feel like his or her knee *gives way.* This instability is caused by an occasional *release* of the muscles in the thigh.

Treatment of knee pain should include ice massage or wrapping an ice pack over the kneecap and strengthening the quadriceps muscles (especially the quadriceps muscle on the inside of the thigh). That muscle is referred to as the vastus medialis.

Prevention of knee pain requires improving the balance of muscle strength between the front and back of the thigh and increasing the flexibility of the leg and lower back.

Distance Runners

Distance runners suffer many of the same injuries sprinters and hurdlers experience.

Plantar Fascitis. An inflammation of the thick, triangular tissue on the bottom of the foot. The fascia attaches at the bottom of the heel and runs to the front the foot, widening as it spreads to attach to the heads of the metatarsals (the long bones of the foot). Symptoms of plantar fascitis are pain on the bottom of the foot with the first few steps taken in the morning, pain present at the beginning of a workout that diminishes during the run only to recur after training, and palpable tenderness at the place on the bottom of the foot where the fascia attaches to the heel.

Treatment for plantar fascitis is I-C-E, rest, stretching the lower leg and small muscles of the foot, and placing a plastic heel cup or ¼-inch felt heel pad inside the running shoe. Some individuals may need to see a podiatrist to be fitted for an orthotic (a custom molded foot-stabilizing device for insertion in the running shoe).

Preventive measures for plantar fascitis include stretching prior to running, wearing supportive shoes that stabilize the heel, and training on soft surfaces such as grass or dirt, rather than asphalt.

Heat Injuries. They are much more likely to be suffered by distance runners than other athletes because of the duration of their events.

Stress Fractures. These are overuse injuries that generally occur in the fifth metatarsal (lateral long bone of the foot) or one of the two bones in the lower leg. Fractures occur when the stress placed on the bone is greater than the muscle supporting the bone can absorb. Symptoms of stress fractures are deep, persistent pain and localized tenderness that increases with activity.

Treatment for stress fractures is immediate referral to an M.D. for an X-ray. The fracture, however, may be undetectable for 8–14 days until the calcification healing process is under way. This may be a season ending injury. It takes 6–8 weeks for bones to heal completely.

Shot Putters and Discus Throwers

Throwers are susceptible to torso and upper limb problems as well as leg injuries.

Tendonitis. This is a common problem for throwers. The sudden explosive movement and the abrupt blocking action required to propel the shot and discus place a great deal of pressure on tendons. There are several tendons that seem to be especially vulnerable to tendonitis. Biceps tendonitis occurs where the biceps muscle on the front of the upper arm attaches near the shoulder. Symptoms are tenderness over the tendon when trying to lift the arm above shoulder height or when lifting an object that requires bending the elbow.

Treatment for tendonitis includes an ice pack or ice massage over the tender area, rest and exercises to improve flexibility and strength. This condition may require referral to an M.D.

Effective preventive measures for tendonitis are improving flexibility and strength and mastering good throwing technique.

Epicondylitis Elbow. This is commonly known as "Little League elbow" or "tennis elbow" and is often seen in novice shot putters. Symptoms are tenderness over the inside (medial) part of the elbow joint, pain on throwing and pain on grasping.

Treatment for epicondylitis elbow is ice, rest, an elbow-sleeve to keep the tendon warm, and possibly physical therapy.

The most effective prevention measure for epicondylitis elbow is using proper putting technique. Good strength, balance and flexibility also help.

Torn Knee Ligaments. There are several ligaments in the knee. The ligament most susceptible to tears is the anterior cruciate ligament (which supports the inside of the knee joint). The injury occurs most often during the plant, just prior to the release of the implement. Symptoms are sudden pain, instability and tenderness around the joint. Sometimes a popping sound can be heard.

Treatment for a torn knee ligament is ice and immediate referral an athletic trainer or a physician.

The most effective preventive measure for torn knee ligaments is a well-balanced strength training program.

Hand Injuries (usually wrist and finger sprains). These sprains occur when the weight of the shot causes an overextension of the joint. In both cases the mechanism of injury causes either the wrist or the fingers to be bent back farther than normal.

Symptoms are pain in the joint, swelling and limited movement.

Treatment for hand injuries should include immersing the hand in a bucket of ice water and taping to support the joint during practice. (Beware of the rules about taping the hand during competition.)

The most effective preventive measure for hand injuries is proper putting technique. (Poor technique is often the result of fatigue at the end of a throwing session.)

Rotator Cuff Tears. The rotator cuff consists of four muscles which hold the head of the humerus (upper arm bone) in its socket. These muscles stabilize the shoulder during the action of throwing. The explosive nature of throwing frequently causes tears or complete ruptures of one or more of the rotator cuff muscles. Symptoms of a rotator cuff tear are pain deep in the shoulder (sometimes radiating down the arm to the elbow) and difficulty in lifting anything for the first 15-degrees of movement to the side.

Immediate treatment for a rotator cuff tear is ice, compression, and referral to a physician. (This is usually a season-ending injury.) Effective preventive action for rotator cuff tears is a well-balanced weight-training program that strengthens not only the large muscle groups around the shoulder, but also includes specific exercises to strengthen the rotator cuff muscles.

Jumpers

Knee Pain (including **patellofemoral pain** or **chondromalacia**).

Hamstring muscle strains.

Ligament Tears. The ligaments most frequently torn by jumpers are the anterior cruciate and the medial collateral ligaments.

Inversion Ankle Sprains. These generally occur upon landing or when planting at takeoff. The mechanism of injury is landing with the sole of the foot turned inward. Symptoms are tenderness around the outside lateral ankle bone where the ligaments attach, swelling, discoloration and limited function.

Treatment for inversion ankle sprains is I-C-E, rest, and referral to a physician if pain persists. The ankle may need to undergo a strengthening program and be taped prior to returning to training.

Effective preventive measures for inversion sprains include training on safe surfaces, emphasizing proper technique and utilization of a well-balanced strength program.

Cartilage Tears. These often result from either a severe twisting motion or a hyperflexing action as one might see in a long jumper's landing. The cartilage is the joint cushion that sits between the tibia (shin bone) and the femur (thigh bone). As the knee flexes and extends, the cartilage can catch between the two bones in such a fashion as to tear it. Once torn, cartilage rarely has the capability to heal itself due to its lack of blood supply. Symptoms are pain in the joint, tenderness when palpated (rubbed) along the joint line, instability and locking or clicking of the joint.

Treatment for a cartilage tear is I-C-E, rest, and referral to an M.D. (This can be a season-ending injury.) The best prevention for joint injuries is a well-balanced weight training program.

Low Back Pain. Back pain frequently results from the jarring impact jumpers experience upon landing. The pain may be caused by stiff muscles in the least severe cases or by a disc or nerve injury in more severe cases. Symptoms range from stiffness to sharp pain sometimes radiating down into the legs.

Treatment for back pain is ice, flexibility exercises, and referral to an M.D. if the pain persists.

Due to the nature of the jumping events, it is impossible to eliminate the jarring impact the spine experiences upon landing. The best prevention for low back pain is a good stretching/flexibility program and a well maintained landing pit.

Neck Injuries. We most often see neck injuries in the High Jump and Pole Vault. **If you have any question as to the severity of the injury, do not attempt to move the athlete!**

A severe neck injury is a medical emergency! If the athlete expresses concern about moving or is experiencing tingling sensations in the arms, fingers, or feet, do not move the athlete! Call the paramedics immediately. It is always better to be overly cautious than to make a mistake that may leave a youngster paralyzed for life.

Returning an Injured Athlete to Competition

Athletes should be free of injury symptoms before you allow them to return to competition. There is a natural temptation on the part of the athlete, coach, and sometimes, parents to get the athlete back into competition and training too soon. When dealing with young athletes who in many cases have never experienced an athletic injury before, it is your responsibility as coach to be the voice of reason when there is not an athletic trainer on staff to help make those decisions. The athlete should be asked daily, “How does your pain rate on a scale of 1 to 10, with 10 being the worst?” When the response is 0, a gradual re-entry to training can begin. Until that time, injured athletes should be involved in a rehabilitation program and other fitness activities to maintain their conditioning. Those fitness activities can include cycling (or stationary bike), swimming, or running in deep water with a life jacket if those activities do not stress the injury.

When an athlete attests to 0-pain and can pass tests that assess the function of the injured body part, he or she is ready to return to competition.

Preparing for Injuries

You should always be able to answer yes to the 10 questions posed at the beginning of this chapter. If you could only have one thing available to deal with injuries at a practice or a track meet, it should be ice! You should also have a well-stocked training kit on hand.

A basic training kit should contain the following medical items:

- Band-Aids
- Disinfectant
- Antibiotic ointment
- Scissors
- Athletic tape
- Elastic wraps for compression
- Underwrap
- Tape adherent
- Gauze pads
- Vaseline or skin lube
- Q-tips
- Cotton balls

Other Health Issues

EXERCISE-INDUCED ASTHMA

Exercise-induced asthma affects approximately 7% of youths in the United States. There is an increased prevalence of EIA among African-Americans versus Caucasians, boys vs. girls and urban children vs. rural children. To the adolescent patient, asthma means wheezing, shortness of breath and/or chronic coughing. EIA may restrict physical activities, affect school attendance, or result in the continual use of medication. Some individuals experience asthmatic symptoms only when exercising. Others suffer asthmatic symptoms daily.

EIA can be recognized by coughing, wheezing, or shortness of breath during or following exercise. The predisposition to EIA symptoms is influenced by the climate (with cold, dry conditions being the most likely to produce EIA), the type of exercise, and the responsiveness, or twitchiness of the airways. If you suspect an athlete has

EIA, refer that athlete to his or her family physician and discuss the potential problem with the parents. EIA does not mean the end of an athletic career. Many successful Olympians have EIA and control the condition with medication.

PERFORMANCE-ENHANCING DRUGS

Performance-enhancing drugs are a realistic choice for today's high school athlete. They are readily available, and they work. The question we must pose to our athletes is, "Are such drugs an ethical or healthy choice?"

This is, and always has been, a moral and ethical issue. There is no gray area when it comes to drugs in sports. Every sport governing body from the National High School Federation to the International Olympic Committee condemns the use of performance-enhancing drugs as cheating. It is ironic that track and field's leadership among sports in providing deterrent testing and penalties for illegal drug use has contributed to the decline of public interest in what is now perceived to be a "drug sport."

The most frequently used performance-enhancing drugs in track and field are anabolic steroids. These are dangerous drugs that can cause permanent damage to vital organs of the body. Steroid abuse has damaging emotional side effects and can result in death. The federal government recently reclassified the sale and distribution of steroids as a Class "A" felony, the same as for cocaine.

There has been a shocking increase in the use of steroids by high school athletes looking for a competitive edge. This is symptomatic of the overemphasis on winning at even the lowest levels of sport in our country. Steroid use among adolescents has become almost epidemic as non-athletes try to get that buffed look without strenuous exercise.

It is your responsibility as a coach to protect the well-being of your athletes and the integrity of your sport by talking to them about steroids.

CHAPTER 7

Performance-Enhancing Drugs & Supplements

One of the greatest challenges in sports is to address the issue of performance-enhancing drugs. Athletes at all levels of play are often tempted to use substances to improve their performance, despite the fact that these drugs may be illegal, unhealthy and/or contrary to principles of fair play. It is important for coaches to be aware of these drugs because athletes often interpret "no message" as tacit approval to use them. The World Anti-Doping Agency that oversees all international sport considers these drugs to be against the "spirit of sport" and surveys of athletes uniformly support a level playing field.

Anabolic-Androgenic Steroids

Anabolic-androgenic steroid use in athletes has been documented since the 1950's and the effects on muscle building and performance are well known to athletes and body builders. Anabolic-androgenic steroids (AAS) are a classic performance-enhancing drug and have almost no legitimate therapeutic indications in athletes. In sport they are used almost exclusively to gain a competitive advantage. Although often called "steroids" or "anabolic steroids", they should properly be referred to as "anabolic-androgenic steroids" because they are testosterone or testosterone-like synthetic drugs that result in both anabolic (increased muscle mass) and androgenic (develops male secondary sex characteristics) effects. Although athletes use AAS for their anabolic results, all AAS have varying amount of androgenic effects that are responsible for most of their adverse reactions. The result is that athletes who take AAS for their anabolic properties, to increase lean body mass or strength, cannot avoid the undesired and often harmful androgenic properties of AAS use. Finally, it is important to distinguish AAS from anti-inflammatory steroids that are called corticosteroids or cortisone. Corticosteroids are legitimately used to treat asthma and other medical conditions, as well as in the form of joint injections to treat inflammation.

AAS can be divided into two categories: exogenous and endogenous steroids. Endogenous AAS are those that are naturally produced by the body in some amounts and can be made into drugs and consumed by athletes. The most commonly used endogenous AAS is testosterone that is made by the testes and is necessary for normal male function. Although it cannot be taken in pill form, testosterone can be injected into a muscle, absorbed through the skin by a patch or gel, or across the lining of the cheek in the form of a pellet. Studies have demonstrated that injections of testosterone in high doses can increase muscle mass.

The other types of AAS are the exogenous or synthetic drugs. These are not produced by the body and are altered in the laboratory to change how a drug behaves in the body. For example, adding certain side chains to testosterone allows the drug to be absorbed orally. Other additions increase the potency of the drug or attempt to decrease side effects. The past few years has seen the appearance of "designer" AAS that were specifically developed to avoid detection by drug testing. Some of these are tetrahydragestrinone (THG), norbolethone and madol (DMT).

The 1990 United States Anabolic Steroids Control Act classified AAS as a Schedule III drug and limited the legitimate therapeutic reasons for using them. Due to the increased availability of newer AAS, the 2004 Anabolic Steroid Control Act was passed and this increased the number of AAS that were considered Schedule III drugs and tightened the definition of AAS. Included in the 2004 Act were THG and norbolethone, as well as many former dietary supplements that include androstenedione, androstenediol and 19-norandrostenedione. As of this time, DHEA is still considered to be a dietary supplement and can be sold over-the-counter.

While there is no debate on the fact that large doses of AAS can increase muscle mass, the effects on actual performance are less clear. In many sports, performance is difficult to measure as it is influenced by factors other than strength alone. Despite the widespread use of anabolic steroids in athletes, there is little data to support its effects on performance. Studies have been limited to obvious targets such as weight lifting and measuring acceleration in sprinters. In addition to strength changes, there are additional AAS effects that may contribute to efficacy in athletes. Many have attributed AAS strength gains to increases in aggressiveness that encourages intensity in both training and competition. Although there are AAS receptors in brain tissue, it is unclear as to their role. Regardless of the actual mechanism, it is clear that athletes believe that AAS improve performance and have continued to use them.

Any discussion of the adverse effects associated with AAS are complicated by the fact that scientific studies use doses of AAS far below what has been reported by athletes. As a result, it is likely that medical studies underestimate the full extent of side effects from AAS use. These studies do not begin to approximate the doses used by athletes that may be 10-40 times the therapeutic dose and in multiple combinations. AAS affect virtually every organ in the body and their effects can be divided into organ system effects, psychological effects, sex-specific effects and potential effects on immature individuals.

The two systems that have been most studied are the cardiovascular and gastrointestinal systems. AAS affect the cardiovascular system by increasing total cholesterol, LDL (bad) cholesterol and blood pressure, while lowering HDL (good) cholesterol. When these are combined with the potential clotting effects of AAS, the risk of coronary artery disease dramatically increases and the possibility of heart attacks. Indeed, there are multiple reports of relatively young AAS users suffering heart attacks. There have also been reports of AAS-induced cardiomyopathy (heart enlargement) following continued use of very high doses of these drugs.

The liver is the main target organ for gastrointestinal effects of AAS with case reports of hepatocellular dysfunction, peliosis hepatitis (blood-pooled cysts) and hepatocellular adenoma and liver cancer. Almost all reports of serious liver problems are the result of the 17-alpha alkylated AAS designed to be taken orally. Reports from the former East German Republic revealed three deaths due to liver failure and several cases of severe liver damage under their AAS program.

There are several other bodily systems that are affected by AAS use, such as the musculoskeletal system and skin. There are multiple reports of tendon ruptures that have been associated with AAS use and some animal studies have demonstrated structural changes in tendons following AAS use. It may be that AAS increase the risk of tendon rupture through muscle enlargement without a corresponding increase in tendon strength. The skin will often be the most obvious organ affected by AAS use and will display acne, striae (skin stretch lines), or abscesses, the latter from injectable use.

The psychological effects of AAS have also been reported with such conditions as the inducement of personality disorders, hyperaggressiveness ('roid rage) and addiction. Although there has been a great deal of conflicting studies, a 2005 review found that AAS could cause aggressiveness, rage, delirium, depression, psychosis, and mania. As with many other AAS effects, the psychiatric conditions appear to be dose dependent, meaning that the more you take, the greater the risk of side effects. Dependency on AAS is also controversial, but some studies have determined that 75% of AAS users met the criteria for dependence and addiction. Whether or not there is a true addicted state is controversial; what is clear is that it can be very hard for some AAS users to stop. Finally, there have also been several unfortunate cases reported in the media of teenagers who became severely depressed shortly after discontinuing AAS use and committed suicide.

Endocrinological effects are generally dependent on the amount of natural testosterone produced. For example, males produce about 7 mg of testosterone per day and females about one-tenth that amount. Men will thus experience decreased or absent sperm counts as well as gynecomastia (male breast enlargement) due to an excessive amount of AAS that is metabolized into estrogens that disturbs the androgen/estrogen balance. Females will experience all of the virilizing effects of AAS including male pattern alopecia (baldness), clitoromegaly, hirsutism, breast atrophy, as well as menstrual disturbances. There is also some evidence that AAS reduce thyroid function and make the user hypothyroid.

There are also many other miscellaneous effects from the use of AAS that may be idiosyncratic. There are reports of constitutional growth delay in youths, reduced immune function, and unusual tendon ruptures, such as the iliopsoas and triceps muscles. If AAS are taken by injection, the risks associated with needle use include contracting blood borne infections, such as hepatitis B, C and HIV (AIDs). Due to their illegal nature, some athletes have been known to utilize AAS from the black market. These have a serious risk for contamination with impurities, false dosages, a high risk of infection or other dangerous risks.

Allegations of AAS use in sport have been present for at least 40 years and seem to be ingrained in athletics. It is clear that they have the ability to increase muscle mass and thus significantly alter the competitive landscape in many sports.

Other Performance-Enhancing Substances

HUMAN GROWTH HORMONE (hGH)

hGH is a polypeptide hormone of 191 amino acids that is produced in the anterior pituitary. Several different isoforms are naturally produced with the predominant one being a 22 kD monomer and about 10% being the 20kD form. Due to its structure, hGH is only effective by injection and cannot be taken orally. hGH is naturally increased by exercise, stress and slow-wave deep sleep. This has led athletes to try drugs such as gamma-hydroxy butyrate (GHB) to stimulate slow-wave sleep and thus, hGH, with often disastrous results. GHB and the related compounds gamma butryolactone (GBL) and butanediol (BD) are banned by the Food and Drug Administration, but are still found illegally. There have been several deaths and serious illnesses associated with these compounds and they should be avoided.

It is not surprising that improvements in drug testing for AAS encouraged athletes to explore alternatives for strength enhancement. There have been several reports of athletes using hGH including Ben Johnson's 1988 admission of combining hGH with anabolic steroids, the discovery of large amounts of hGH in a Tour de France support vehicle in 1998 and the confiscation of hGH from the baggage of Chinese swimmers prior to the 2000 Sydney Olympics. The effects of hGH are felt to be as a "partitioning" agent whereby protein synthesis is favored over fat synthesis. This is opposed to AAS that is a direct inducer of muscle growth.

Evidence of performance enhancement with hGH are limited because athletes take much larger doses than can be given ethically in research. One small study demonstrated some improvement in lean body mass, but no studies have definitively demonstrated increases in strength or athletic performance.

There are significant adverse effects of hGH when used in healthy adults. Short-term use can result in fluid retention and muscle edema, while long-term use can cause arthralgias, diabetes, muscle disease, carpal tunnel syndrome and acromegaly. Acromegaly is a disease of growth hormone overproduction and can result in musculo-skeletal changes, especially to the skull, jaw, hands and feet. The other concern with hGH is black market contamination. Although hGH is now biosynthesized, there is still likely some hGH on the black market that was extracted from the pituitary glands of cadavers. This has the possibility of causing infections, such as the virus responsible for "Mad Cow Disease." Due to its popularity and difficult availability, there are a great number of counterfeit products claiming to either be hGH or increase hGH secretion. Many of these products are pills and powders to be taken by mouth and since hGH cannot be absorbed orally, their claims are dubious at best.

While there are a few studies and anecdotal reports of hGH use in healthy adults, there is no data on its use in children and adolescents. Growth hormone is used in the treatment of growth hormone deficient children and some conditions of short stature. When hGH became available, physicians were flooded with requests from parents of normal children asking for the drug so that their children could achieve extraordinary height. It would be expected that attempts to alter the growth hormone-pituitary system would result in significant risks to children and adolescents. Although there is currently no effective test for hGH, researchers are working on several different methods of detection and it is likely that a drug test will soon be available. There is significant temptation to use hGH in the youth population, not so much for muscle gain, but for height enhancement.

ERYTHROPOIETIN (EPO)

EPO is a hormone that is produced in the kidneys and is responsible for regulating the red blood cells (hemoglobin) in the body. EPO, and its related compound darbepoetin, have been synthesized through recombinant manufacturing and are available for the medical treatment of anemia. Athletes in endurance sports, such as cycling or long-distance running, began abusing EPO in order to increase endurance. This is because the amount of red blood cells determines how much oxygen can be delivered to exercising muscle. Unfortunately, too many red blood cells in the circulation can cause the blood to thicken and result in heart attacks and strokes. In fact, the suspicion is that several cyclists died in the 1980's as a result of excessive use of EPO. There is no evidence that EPO can increase muscular strength. In 2000, an effective test was developed to detect EPO and that has been commonly in use since.

STIMULANTS

Stimulants are a broad class of drugs that are related to naturally occurring adrenaline. These drugs act either directly or indirectly on the sympathetic nervous system and are available in foods (coffee, sodas and energy drinks) over-the-counter, prescription drugs or as illegal recreational drugs on the black market. They have a wide variety of actions in the body and the effect of a particular drug in this class depends on which receptor it favors. For example, some stimulants like an albuterol inhaler that is used in the treatment of asthma relax smooth muscle and open the pulmonary tree. In general, almost all drugs in this class act to speed up the heart rate, increase blood pressure and cause all of the effects of adrenaline, the "fight or flight" hormone. Some examples of stimulants include ephedrine, pseudoephedrine, caffeine, Ritalin, Adderal, albuterol, amphetamines, methamphetamine, cocaine, phenylephrine and phenylpropanolamine.

There is evidence that athletes have used stimulants since the Roman Gladiators in 600 B.C. At the 1960 Summer Olympic Games, a Danish cyclist died during competition from an overdose of stimulants. Today's athletes use stimulants for a variety of reasons. Some use them for their stimulants properties to feel more energetic, alert, to fight fatigue and improve performance. This is despite the fact that although you may feel more energetic, there have never been any controlled studies to definitively demonstrate performance enhancement. In sports where thinness is valued, such as gymnastics and wrestling, athletes use them as diet aids to decrease appetite, burn calories and lose weight. Athletes may also legitimately use stimulants to treat diseases, such as asthma and attention-deficit disorder (ADD or ADHD). Finally, athletes use stimulants as a recreational drug to get high in the form of drugs such as methamphetmine.

Depending on the particular drug, stimulants can have a great many adverse effects. In general, they can cause anxiety, heart palpitations, rapid heart rate and arrhythmias, tremors, stomach upset, and insomnia. Since stimulants often increase the metabolism, there is a real concern about athletes exercising in the heat and the stimulants contributing to heat illness. Several prominent athletes have died while exercising due to the effects of stimulants. In addition, many of these substances are addictive with the need for increasing doses and then requiring a depressant, such as marijuana or alcohol in order to slow down afterwards.

Stimulants are readily available in our culture and while small amounts of drugs like caffeine are usually not harmful, the concern is when large doses or multiple drugs are used. For example, an athlete may have 2 cups of coffee in the morning, several caffeinated soft drinks throughout the day, caffeine-containing energy drink (e.g. Red Bull®) before practice, over-the-counter pseudoephedrine and dietary supplements containing guarana or Citrus Aurantium. All of these contain varying amounts of stimulants and the combination can cause serious problems. It is imperative to be aware of the total amount of stimulants that an athlete may be consuming.

NUTRITIONAL SUPPLEMENTS

The 1994 Dietary Supplement Health and Education Act (DSHEA) unleashed a whole host of dietary supplements on the American consumer. These include vitamins, minerals, amino acids, plant derivatives and other natural and synthetic substances that come in a variety of forms, including powders, tablets and liquids. While this creates a great deal of confusion, one thing is very clear: dietary supplements are aggressively marketed to athletes.

Despite all of the conflicting information on supplements, there are a few facts that are worth noting:

1) Dietary supplements are not regulated by the same laws as over-the-counter and prescription drugs. There is very little regulation of dietary supplements and many studies have found that many supplements do not contain what is on the labels. As a result, it is difficult to know with 100% certainty if what is on the label is really what you are taking.

2) Supplements can be contaminated with impurities that will result in a positive drug test. Whether unintentionally or intentionally, some athletes have tested positive from taking contaminated supplements.

3) Most supplements have not been subjected to rigorous studies that prove their positive effects. Due to labeling laws, the only restrictions on dietary supplements are that they cannot claim to treat a disease. Other than that, they can legally make a

wide variety of claims without medical proof.

4) Most of the substances that are available as dietary supplements can be easily and more cheaply obtained from the diet through good nutrition.

There are a tremendous number of dietary supplements on the market with more appearing every day. Athletes are often approached to try a new product. The best advice is to check with a certified athletic trainer, physician or registered dietician before taking any dietary supplement. As a rule of thumb, if a product claims to "build muscle" it may contain a form of AAS. If it claims to "increase energy" it may contain a stimulant.

Although it is impossible to provide details on every supplement, here are a few popular types.

DHEA

Dihydroepiandrosterone (DHEA) is the only relative of AAS that was left off the 2004 Anabolic Steroid Control Act and continues to be sold as a dietary supplement. DHEA is metabolized in the body to androstenedione, which is metabolized to testosterone. It is worth noting that while very little DHEA is converted to testosterone in men, DHEA does get converted to estradiol (a female hormone) as well. There are no studies demonstrating either performance enhancement with DHEA or strength gains in normal males. Because only a small amount of testosterone results from taking DHEA, it is likely that its greatest effects would occur in females and developing adolescent males.

CREATINE

Creatine is one of the most widely used nutritional supplements by athletes and has been touted for its ability to increase strength and power. Creatine comes from three sources: it is a natural substance found in foods, the body is able to make it, and it can also be prepared synthetically as a dietary supplement. The average diet contains 1-2 grams/day of creatine from protein-rich foods such as meat and fish. It is also naturally produced by the liver, pancreas and kidneys from the amino acids methionine, glycine and arginine at a rate of 1-2 grams/day. Although 90% of creatine is stored in skeletal muscle as free creatine and phosphocreatine, it is also found in the brain and testes.

The initial justification for oral creatine supplementation was the 1992 study of a 20% increase in skeletal muscle creatine following a 7-day loading dose. Skeletal muscle phosphocreatine is rapidly depleted during 10-20 seconds of maximum exercise, but half is resynthesized after 60 seconds with full restoration in 5 minutes. Theoretically, taking oral creatine can potentially increase phosphocreatine stores and thus power.

Whether creatine supplementation actually provides performance benefit has been the subject of great debate. Most data suggest that oral creatine could only increase performance in repeated 6-30 seconds bouts of exertion where there are recovery periods of 20 seconds to 5 minutes. They found no benefit in the other situations. There is little evidence that these gains found in a laboratory or in research translate into improved athletic performance.

Another factor complicating creatine is the variation in individual response. Muscle-biopsy studies demonstrated that subjects with lower levels of both muscle creatine and phosphocreatine tended to have greater increases in creatine and phosphocreatine after taking creatine supplements. One factor is that skeletal muscle act as a "creatine bank" and cannot exceed a creatine concentration of 150-160 mmol/kg. Thus, athletes who consume less dietary creatine, e.g. vegetarians, may benefit more from creatine supplementation. That also means that once your creatine banks are full, taking additional creatine is of little benefit. There is also likely little value to high-dose creatine supplementation. If creatine is to be used, most authors recommend 0.3 g/kg/day (0.15 g/pound/day) loading for 5 days, followed by 0.03 g/kg/day (0.015 g/pound/day) maintenance. Increasing the dosage will not increase the positive effects. As with other substances, there is a direct correlation between excessive dosage and the risk of side effects.

Another area of controversy is that of adverse effects. Creatine causes water to be retained by the muscles, thus pulling water away from the circulation where it is needed and giving the potential for dehydration, muscle cramping and heat injury. Although there are anecdotal reports, controlled studies do not seem to support a large increase in these symptoms nor related gastrointestinal cramping. Another fear was that once creatine muscle stores were saturated, excess creatine would unduly tax the kidneys and result in kidney problems. While urinary creatine and creatinine excretion does increase with oral creatine supplementation, there have been few reported incidents of kidney failure in subjects with normal kidney function.

However, it would seem sensible that athletes with kidney disease or other health problems should not take creatine without physician supervision.

The most worrisome complication from creatine use is the development of lower-extremity compartment syndromes. Studies have demonstrated increased muscle size due to water retention and there are reports of acute compartment syndromes and rhabdomyolysis (muscle damage). This is an important concern given the large numbers of creatine users.

As with other supplements, there is very little information about the manufacturing and purity standards of creatine. There have also not been any studies on the interaction of creatine with other supplements or medications.

EPHEDRINE AND CITRUS AURANTIUM ("Bitter Orange" or "Zhi Shi")

Ephedrine, a sympathomimetic amine, has been implicated in the deaths of several athletes and this has prompted a closer examination of ephedrine. Until 1994, ephedrine was mainly consumed in over-the-counter decongestants and prescription drugs and the biggest concern was that it could be used to manufacture methamphetamine. The United States Dietary Supplement Health and Education Act (DSHEA) of 1994 ushered in a new era for nutritional supplements and herbal ephedra has been advertised as both a weight-loss product and an energy booster. Due to the high number of adverse effects, the US Government banned ephedra in 2003.

It is important to distinguish between pharmaceutical-grade ephedrine and herbal-extract ephedra sold as a dietary supplement. The latter has been available in China for thousands of years as Ma Huang and although its active ingredient is ephedrine (one of many ephedra alkaloids), it also contains pseudoephedrine, methylphenedrine, methylpseudoephedrine and norpseduoephedrine (cathine). The presence of multiple compounds is further exacerbated by lack of governmental oversight due to DSHEA. As with other supplements, studies of ephedra-containing herbal supplements found that half exhibited major discrepancies between content and the labels with significant lot-to-lot variations among products. This demonstrated that ephedra labels are not a reliable indicator of content.

Ephedrine is an adrenergic stimulant that causes vasoconstriction (tightening of the blood vessels), bronchodilation (opening of the lung passages), and tachycardia (fast heart rate). As such, it has been associated with cerebrovascular events (stroke), heart attacks, major psychiatric symptoms, and death. At least 100 cases of death or severe reactions have been definitely or possibly related to ephedra in the United States. In about half of these cases, the individuals were less than 30 years old. There is also a concern in that athletes may use multiple types of stimulants, such as caffeine and pseudoephedrine (pseudophed) in combination and this may increase side effects. Lastly, stimulants such as ephedra increase heat production and when athletes exercise in hot weather, this puts them at increased risk for heat illness and heat stroke.

Although athletes frequently consume ephedra products, there are no studies using ephedra-containing dietary supplements for performance-enhancement. The only related studies are a small number that used pharmaceutical ephedrine alone or in combination with caffeine. Most of these utilized military recruits as subjects and measured short-term use. Ephedra is also marketed as a thermogenic for weight loss and this appeals to athletes trying to lose weight.

Reports of adverse reactions have led supplement manufacturers to promote "ephedrine-free" products and many interpret this to mean "stimulant-free." In actuality, these products usually contain Citrus Aurantium, otherwise known at Bitter Orange of Zhi Shi. The main ingredient is likely synephrine, but it also contains octopamine and tyramine. Synephrine is a close relative of ephedrine and has similar effects and will likely result in similar adverse reactions as the number of users increases.

L-ARGININE OR NO2

Nitric oxide has become a popular dietary supplement due to its purported use as a "hemo-dilator." It is touted to increase blood flow to exercising muscle, prevent heart disease, treat male infertility and kidney disorders. In reality, these supplements contain the amino acid L-arginine that is widely available in the diet. L-arginine is also synthesized in the liver and can be taken as a dietary supplement. Its popularity stems from the fact that animal studies demonstrate that increasing L-arginine in the diet can increase the formation of nitric oxide and changes in blood vessels. A small study of L-arginine revealed that although L-arginine levels increased, there was no change in the nitrate levels. Further more, 80% of the subjects in the study complained of adverse effects, including diarrhea, vomiting, headache and nosebleeds. As with other supplements, it appears that L-arginine has limited positive effects and possibly significant side effects. L-arginine is not considered a prohibited substance.

CONCLUSION

There is often intense pressure for athletes to perform and for coaches to win. Performance-enhancing drugs are readily available and there is a large temptation to use these substances. It is imperative that coaches send a clear message about discouraging the use of these drugs and recognize signs of their use. If a coach or parent does not have accurate information about drugs or nutritional supplements, it is essential to consult a professional, such as a physician, certified athletic trainer or registered dietician.

Chapter

8

Eating for Health and Performance

Good nutrition is an important component of any successful training program. Food is the fuel of athletic performance. Though you cannot control the food your athletes eat, you can guide them toward healthy eating. To do so, you must be acquainted with the basics of proper nutrition. This chapter is a primer to help you address some of the nutritional demands and concerns faced by your athletes.

Though success in sports is determined primarily by athletic ability and proper training, nutrition affects the athlete in many ways. Nutrition is important for normal growth and development and for maintaining good health. A healthy athlete feels better, trains harder, recovers more quickly and is less susceptible to illness.

As a coach, you can have a positive influence on your athletes' attitudes about nutrition as well as their eating habits. Young athletes, in particular, respect, admire and seek advice from their coaches. The following sports nutrition information will help you guide your athletes toward better eating, and ultimately, better health and performance.

The Athlete's Diet

Coaches often want to know exactly what constitutes a "balanced diet." A balanced diet provides all the necessary nutrients and calories the body needs to function properly. These nutrients are carbohydrates, fats, proteins, vitamins, minerals and water. Just as there are many training strategies that achieve victory, there are a number of dietary patterns that provide good nutrition.

The Dietary Guidelines for Americans are national guidelines for healthy eating. Most nutritionists agree that the nutritional guidelines developed to promote health also establish a good foundation for athletes who desire peak performance.

USDA MY PYRAMID

The USDA My Pyramid (Fig. 8-1) serves as educational tool to put the dietary guidelines into practice. The pyramid shows the foods that should be included in a healthful diet, and in what amounts. Athletes should be eating heartily from the grain, vegetable and fruit groups since these groups have the highest recommended number of servings and are nutrient-rich sources of carbohydrate. Table 1 indicates what counts as a serving from each group.

The amount of calories a person needs to eat depends on his or her age, gender and level of physical activity. Daily recommendations from the USDA dietary guidelines for high school-age boys and girls from 14 to 18 years of age are listed by food groups in the following table, (with a limited use of fats and oils, kept at 5-6 teaspoons).

CALORIE REQUIREMENTS FOR ATHLETES

Calorie requirements vary greatly from person to person and are influenced by the level of physical activity, body size and age. Therefore, it is impossible to establish a universal daily caloric requirement for athletes. Weight loss, weight maintenance, or weight gain is a matter of energy balance. An athlete's body weight will stay the same when calorie intake equals calorie expenditure. To lose weight, energy expenditure must be greater than energy intake. To gain weight, energy intake must be greater than energy expenditure. If an athlete is maintaining his or her ideal competitive weight, adequate calories are being consumed.

A number of factors influence the body weight of adolescent athletes. Many young female athletes are concerned about their appearance and eat less than they should to appear thin. However, restricting calories can have a negative impact on performance and health. As calorie consumption decreases, so does nutrient intake. The minimum requirement for high school athletes should be roughly 2,000 to 2,200 calories per day. Athletes eating less than 1,800 calories a day probably do not consume adequate amounts of vitamins, minerals and protein. This can cause depleted fuel stores, muscle wasting, weakness, fatigue, stress fractures and impaired performance.

Some athletes have a hard time increasing their calorie intake because the volume of a larger meal causes them discomfort, especially if they are training soon after eating. Athletes juggling a heavy academic schedule with training and part-time job may have difficulty finding the time to eat. These athletes can benefit from eating several small meals and snacks throughout the day.

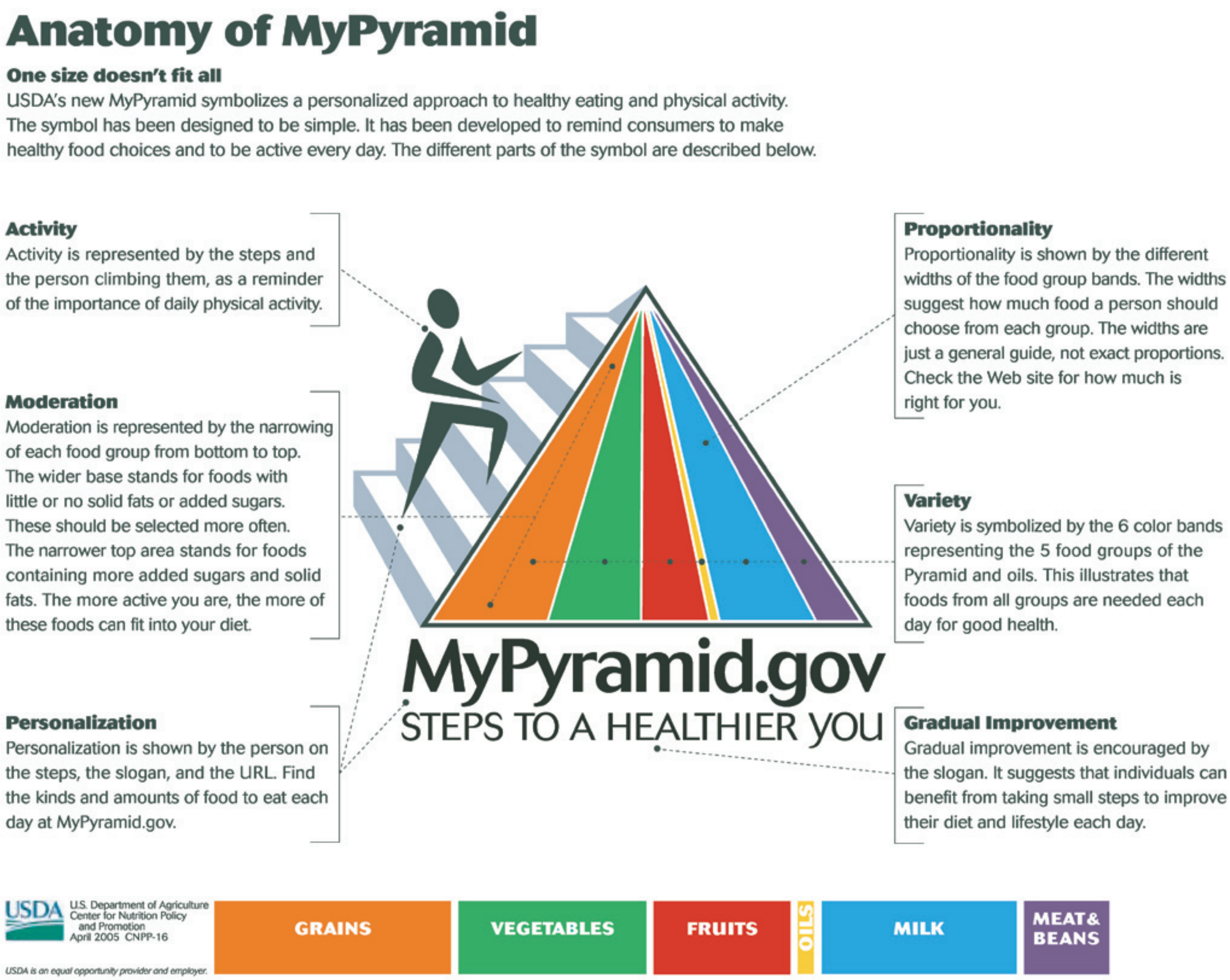


Fig. 8-1 The USDA My Pyramid

Food Group	Daily Servings	Size Equivalents
Grain Group Make half your grains whole	6 - 7 ounces	1 ounce = • 1 mini bagel • ½ cup cooked oatmeal, 1 pkg. instant • 1 cup breakfast cereal, flakes or rounds • 1 ½ cup breakfast cereal, puffed • ½ cup cooked or 1 ounce dry pasta or rice • 1 small tortilla, corn or flour, 6" diameter
Vegetable Group Vary your veggies	2½ - 3 cups	1 cup = • 1 cup chopped or florets of broccoli • 3 spears broccoli • 2 cups raw leafy greens • 2 medium carrots • 2 cups raw leafy greens • 2 medium carrots
Fruit Group Focus on fruits	1½ - 2 cups	1 cup = • 1 small apple • 1 large banana • 32 seedless grapes • 1 large orange • 8 large strawberries • 8 ounces 100% fruit juice
Milk Group Get your calcium-rich foods	3 cups	1 cup = • 1 cup milk • 8 ounces yogurt • 1½ ounces hard cheese (cheddar, mozzarella, Swiss, parmesan) • 1 cup pudding, made with milk • 1 cup frozen yogurt
Meat & Bean Group Go lean with protein	5 - 6 ounces	1 ounce = • 1 ounce meat, poultry, fish • ¼ cup cooked dry beans • 1 egg • 1 tablespoon peanut butter • ½ ounce nuts or seeds

Table 1 Serving Sizes

CARBOHYDRATES

Carbohydrates, such as sugar and starch, are the most readily available source of food energy. During digestion and metabolism, all carbohydrates are eventually broken down to the simple sugar glucose for use as the body's principal energy source. Glucose is stored in the muscles and liver as a substance called glycogen. A high-carbohydrate diet is necessary to maintain muscle glycogen – the primary fuel for most sports. When athletes do not eat enough carbohydrate, their glycogen stores quickly become depleted, resulting in fatigue or staleness.

Though the body uses both the sugars and starches for energy, a high-performance diet emphasizes nutrient-dense carbohydrates. Nutrient-dense carbohydrates such as whole grain breads and cereals, rice, beans, pasta, vegetables and fruit supply other nutrients such as vitamins, minerals, protein and fiber. Sweet foods that are high in sugar (candy bars, donuts and cookies) supply carbohydrate, but they also contain a high amount of fat and only insignificant amounts of vitamins and minerals.

Fruit contains the sweetest of all simple sugars – fructose. Since fruit is mostly water, its sugar and calorie content are relatively low. Like starchy foods, most fruits are rich in nutrients and virtually fat free.

As with calories, carbohydrate needs vary among athletes, depending on the intensity and duration of training and body size. To determine how much an individual athlete needs, divide his or her weight by 2.2 to get the weight in kilograms. Then multiply the number by 6 to 8.

For example:

- 130 pounds divided by 2.2 = 59 kilograms
- 59 kilograms times 6 = 354 grams of carbohydrate

The carbohydrate content of different foods can be determined by reading food labels. As a general guide, starchy foods and fruits provide the highest amount of carbohydrate (15 grams) per serving. Table 2 gives some examples of high carbohydrate foods.

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Carbohydrate Food	Serving Size	Grams of Carbohydrate
Raisins	1/2 cup	57
Banana	1 whole	27
Apple	1 whole	21
Orange	1 whole	15
Orange Juice	1/2 cup	12
Grapes	1/2 cup	8
Cantaloupe	1/2 cup	7
Watermelon	1/2 cup	6
Corn	1/2 cup	17
Potatoes	1/2 cup	16
Green Peas	1/2 cup	11
Carrots	1/2 cup	8
English Muffin	1 whole	26
Whtite Rice	1/2 cup	17
Tortilla Shell	1 whole	1
Pasta	1/2 cup	15
Kidney Beans	1/2 cup	13
Wheat Bread	1 piece	13
Pancake	1 whole	9
Breakfast Cereals	1/2 cup	8-13
Crackers	1 whole	2-8
Plain Popcorn	1/2 cup	2
Flavored Yogurt	1 cup	42
Plain Yogurt	1 cup	16
Skim Milk	1 cup	12
Granola Bar	1 whole	67
Gumdrops	1 ounce	25
Regular Soft Drinks	1 cup	25
Jelly	1 tablespoon	13
Fig Bar	1 whole	11
Exceed Hi-Carb	1 cup	59
Gatorlode	1 cup	47
Nutrament	1 cup	30
Exceed	1 cup	17
Gatorade	1 cup	15

Table 2 Carbohydrates

PROTEIN

Protein is a major structural component of all body tissues and is required for muscle growth and repair. Protein is not a significant energy source during rest or exercise. Although athletes have slightly higher protein requirements than non-athletes, athletes usually consume enough protein unless they are not eating enough calories. Protein requirements increase when calorie intake is inadequate because the protein is used for energy rather than for muscle growth and repair.

Current research on protein requirements suggests that athletes need about 1.2 to 1.7 grams of protein per kilogram of body weight daily. For a 154 pound (70 kilogram) athlete, this represents 84 to 119 grams of protein a day. This amount is adequate for athletes who are involved in both endurance and explosive events. Table 3 gives some examples of high protein foods.

The proteins in both animal and plant foods are composed of structural units called amino acids. Of the more than 20 amino acids that have been identified, nine must be provided by our diet and are called essential amino acids. Meat, fish, dairy products, eggs and poultry contain all nine essential amino acids and are called complete proteins. Vegetable proteins, such as beans and grains, are called incomplete proteins because they do not supply all of the essential amino acids.

The body can make complete proteins if a variety of plant foods – beans, grains, vegetables, fruits, nuts, and seeds – and sufficient calories are eaten during the day. Since the body utilizes amino acids from foods eaten at different meals, vegetarians don't need to combine specific foods within a meal to achieve complete proteins.

FAT

Fats, or lipids, are the most concentrated source of food energy. One gram of fat supplies about nine calories, compared to the four calories per gram supplied by carbohydrate and protein. Fats are the body's only source of the essential fatty acids linoleic and linolenic acid that are required for growth, healthy skin and healthy hair. Fat insulates and protects the body's organs against trauma and exposure to cold. Fats are also involved in the absorption and transport of the fat-soluble vitamins.

Protein Food	Serving Size	Grams of Protein
Lean Beef	3 ounces	24
Chicken Breast	3 ounces	24
Pork Chop	3 ounces	22
Fish	3 ounces	21
Roasted Peanuts	1/2 cup	18
Macaroni & Cheese	1/2 cup	9
Whole Milk	1 cup	8
Skim Milk	1 cup	8
Yogurt	1 cup	8
Cheddar Cheese	1 ounce	7
Cooked Navy Beans	1/2 cup	7
Egg	1 whole	6
Luncheon Meat	1 ounce	5
Peanut Butter	1 tablespoon	4
Bran Flakes	1 cup	4
Green Peas	1/2 cup	4
Baked Potato	1 whole	3
Wheat Bread	1 slice	3
Broccoli	1/2 cup	2
Banana	1 whole	1
Orange	1 whole	1

Table 3 Protein

All athletes need a certain amount of fat in their diets and on their bodies. The challenge is eating a diet that provides the right amount. Most U.S. health agencies recommend consuming no more than 30 percent of calories from fat. Too much fat contributes excess calories in the diet, which can lead to weight gain. High fat diets can also increase the risk of heart disease and certain cancers. Also, athletes who eat too much fat often do not eat enough carbohydrate, which is detrimental to good health and optimum performance.

To lower fat intake, athletes should choose lean meat, fish, poultry, and low-fat dairy products. Fats and oils should be used sparingly. Fried foods and high fat snacks should be limited.

VITAMINS

Vitamins are metabolic regulators that help govern the processes of energy production, growth, maintenance and repair. Vitamins do not provide energy, although vitamins are important for the release of energy from carbohydrates, fats and proteins.

Vitamins are divided into two groups: water-soluble and fat-soluble. Fat-soluble vitamins include A, D, E and K. They are stored in body fat, principally in the liver. Taking a greater amount of vitamins A and D than the body needs over a period of time can produce serious toxic effects. Vitamins C and the B complex are soluble in water and must be replaced on a regular basis. When athletes consume more water-soluble vitamins than needed, the excess is eliminated in the urine. Though this increases the vitamin content of the urine, it does not help performance.

Athletes should try to consume the amount of a nutrient recommended by the Recommended Dietary Allowance (RDA) or Adequate Intake (AI). The RDA and AI are the amount of a nutrient that meets the estimated nutrient needs of most people. To avoid toxicity, athletes should not exceed the Tolerable Upper Intake Level (UL) for a nutrient.

Generally, athletes who consume more than 1,800 calories a day get enough vitamins from their food. However, a vitamin/mineral supplement supplying 100 percent of the RDA or AI may be appropriate for athletes with extremely low calorie intakes or for those who avoid foods groups.

MINERALS

Minerals serve a variety of important functions in the body. Some minerals, such as calcium and phosphorus, are used to build bones and teeth. Others are important components of hormones, such as iodine in thyroxin. Iron is crucial in the formation of hemoglobin, the oxygen carrier within red blood cells.

Minerals also contribute to a number of the body's regulatory functions. These include regulation of muscle contraction, conduction of nerve impulses, clotting of blood, and regulation of normal heart rhythm.

Minerals are classified into two groups based on the body's need. Major minerals, such as calcium, are needed in amounts greater than 100 milligrams per day. Minor minerals or trace elements, such as iron, are required in amounts less than 100 milligrams per day. Calcium and iron deserve special attention because of their importance in an athlete's diet.

Iron is crucial for athletes because it assists in oxygen transport in the blood and utilization by the muscles. A lack of iron hurts performance by decreasing the capacity of the muscle to use oxygen. Young female athletes in particular are at risk of iron deficiency due to increased iron losses through menstruation and typically low iron intake. It is recommended that coaches see that their female athletes have hemoglobin levels checked at least once a year.

If one of your athletes appears to be iron deficient, you should consult your team physician for diagnosis and treatment. Supplemental iron may be prescribed for individuals whose lab tests indicate iron deficiency. However, a routine use of iron supplements by all athletes is not recommended.

The RDA for iron is 18 milligrams for women and 8 milligrams for men. Animal iron sources are better absorbed than vegetable iron sources. Vitamin C-rich foods (orange juice) enhance iron absorption. Iron-enriched or fortified cereal/grain products provide additional iron. Beans, peas, split peas and some dark green leafy vegetables are good vegetable iron sources. Table 4 lists good sources of iron and the milligrams of iron each provides.

Iron Food	Serving Size	Milligrams of Iron
Pork Liver	3 ounces	17.7
Chicken Liver	3 ounces	8.4
Oysters	3 ounces	6.9
Beef Liver	3 ounces	6.6
Dried Apricots	1/2 cup	5.5
Turkey	3 ounces	5.1
Prune Juice	1/2 cup	4.9
Dried Dates	1/2 cup	4.8
Pork Chop	3 ounces	4.5
Beef	3 ounces	4.2
Dried Prunes	1/2 cup	3.9
Kidney Beans	1/2 cup	3.0
Baked Beans w/Pork & Molasses	1/2 cup	3.0
Hamburger	3 ounces	3.0
Soy Beans	1/2 cup	2.7
Raisins	1/2 cup	2.5
Lima Beans	1/2 cup	2.5
Dried Figs	1/2 cup	2.2
Spinach	1 cup	2.0
Mustard Greens	1/2 cup	1.8
Peas	1/2 cup	1.4
Eggs	1 large	1.2
Sardines packed in oil	1 ounce	1.0

Table 4 Iron

An adequate calcium intake is important not only to prevent osteoporosis (bone deterioration), but because calcium also helps to maintain bone density and prevent stress fractures. An athlete's calcium needs are greatest during adolescence, when the bones are growing. Young women athletes who develop amenorrhea (absence of menses) have increased bone loss. This is a serious health risk, since once bone mass is lost, it may never be fully replaced.

The AI values for calcium are 1,300 milligrams for youths and adolescents ages 9 to 18. If an athlete does not consume four servings of calcium rich foods such as milk, cheese, yogurt, or green leafy vegetables each day, a calcium supplement may be necessary. One glass of milk contains 300 milligrams of calcium. Table 5 lists good sources of calcium and the milligrams of calcium each provides.

WATER

Water is the most essential of all nutrients for athletes. At rest, athletes need at least two quarts of fluid daily. An adequate supply of water is necessary for control of body temperature during exercise, for energy production, and for elimination of waste products from metabolism. Dehydration – the loss of body water – impairs exercise performance and increases the risk of heat injury.

Consuming adequate fluid before, during and after exercise is vital for safeguarding health and optimizing athletic performance. Athletes should drink 14 to 22 ounces of fluid two to three hours before exercise. During exercise, athletes should drink 6 to 12 ounces of fluid every 15 to 20 minutes. Fluid intake should closely match the fluid loss from sweating to avoid the detrimental effects of dehydration. After exercise, athletes should drink at least 16 to 24 ounces of fluid to replace every pound of body weight lost during exercise.

Thirst is not an adequate guide to fluid replacement. Most athletes replace only 50 percent of their fluid losses during exercise. Encourage athletes to replace fluids by drinking according to a time schedule rather than in response to thirst.

Sports drinks containing carbohydrate and sodium are recommended during intense exercise lasting longer than an hour. The carbohydrate helps to delay fatigue, improve fluid absorption and replace glycogen following exercise. The sodium helps to stimulate thirst, increase voluntary fluid intake and enhance fluid retention.

Calcium Food Sources	Serving Size	Milligrams of Calcium
Plain Yogurt	1 cup	415
Skim Milk	1 cup	296
Whole Milk	1 cup	288
Cottage Cheese	1 cup	282
Swiss Cheese	1 ounce	248
Mozzarella Cheese	1 ounce	207
Cheddar Cheese	1 ounce	204
Ice Cream	1 cup	175
Oysters	1 cup	343
Salmon w/ Bones	1 ounce	86
Sardines w/ Bones	1 ounce	74
Turnip Greens	1/2 cup	184
Mustard Greens	1/2 cup	183
Collard Greens	1/2 cup	152
Spinach	1/2 cup	83
Broccoli	1/2 cup	67
White Beans	1/2 cup	50
Cabbage	1/2 cup	49
Kidney Beans	1/2 cup	48
Lima Beans	1/2 cup	38
Carrots	1/2 cup	37
Prunes	8 large	90
Orange	1 medium	62
Tangerine	1 large	40
Almonds	1/2 cup	152
Walnuts	1/2 cup	60
Peanuts	1/2 cup	54
Pecans	1/2 cup	43

Table 5 Calcium

Pre-Competition Meals

The primary purpose of the pre-competition meal is to provide energy and fluid for the athlete during the game. Carbohydrate-rich foods provide the quickest and most efficient source of energy, and unlike fatty foods, are rapidly digested. Since many athletes experience abdominal discomfort if they have food in their stomachs during competition, the timing of the meal is important. To avoid potential gut distress, the calorie content of the meal should be reduced the closer to exercise the meal is consumed. A small meal of 300 to 400 calories is appropriate an hour before exercise, whereas a larger meal can be consumed four hours before exercise.

The athlete's foods and fluids should be well tolerated, familiar (tested in training) and palatable. Athletes may have to do some planning to ensure they have access to familiar foods before competition. They may need to bring their lunch/snacks in a small cooler rather than choosing from the school cafeteria's entrees or a restaurant menu. Encourage them to bring any foods that they believe will help them win.

Experimenting with a variety of pre-exercise meals in training helps athletes determine what foods they are most likely to handle before competition. Athletes should never try an untested food or fluid before competition. The result may be severe indigestion and impaired performance.

Fueling During Competition

During tournaments or meets, athletes require fluids and carbohydrate throughout the day. Some athletes may be reluctant to eat and drink because they have to compete again. However, failing to refuel and replace fluid losses can cause their performance to deteriorate, particularly toward the end of the day. Bringing along a cooler packed with familiar high-carbohydrate, low-fat meals and snacks keeps athletes from then being dependent on the high-fat fare typical of concession stands.

Since everything an athlete eats before a competition may be considered a pre-event meal, it is important to consider the amount of time between competitions. If there is less than an hour between games or events, athletes can consume liquid meals, sports drinks, carbohydrate gels, fruit juices, and water. When there is an hour or two between games or events, athletes can consume easily digestible carbohydrate-rich foods such as fruit, grain products (fig bars, bagels, graham crackers), low-fat yogurt, and sports bars in addition to drinking fluids. When games or events are separated by three hours or more, the athlete can consume high-carbohydrate meals along with drinking fluids.

Achieving Ideal Competitive Weight

Some athletes fight to keep pounds off; others struggle to keep pounds on. Genetics, age and training all influence body weight. Food intake and lifestyle also play important roles. Athletes will perform at their best if they achieve their competitive weight (while adequately hydrated) either in the off-season or early in the season. Allowing for an increase in lean tissue and decrease in body fat during training, the athlete should try to maintain that weight throughout the season.

Young athletes with busy schedules tend to have irregular eating habits and sleeping patterns. As a result, gaining weight or keeping it on can be a problem. Athletes who have difficulty gaining weight generally aren't eating enough calories. Athletes can increase calorie intake by changing the amount and type of food eaten, and increasing the frequency of meals and snacks. To gain weight, athletes should eat five to six times a day.

To lose weight, athletes need to reduce their calorie intake. Increasing activity in addition to reducing calories helps promote weight loss. The recommended rate of weight loss is one-half pound a week, which requires a caloric deficit of 250 to 300 calories per day. Paying attention to the amount of and types of food eaten is important. Eating fewer high fat foods such as fried foods, gravies, sauces, high fat snacks and deserts can significantly reduce calorie intake.

A safe level of caloric restriction depends on the athlete's normal dietary intake. Males should not consume fewer than 2,000 calories per day. Females should not consume fewer than 1,800 calories per day. Extreme caloric restriction can disrupt physiological function, nutritional status, hormone levels, bone mineral density, psychological function and, for young athletes, growth rate.

Eating Disorders

Losing weight to achieve the "ideal" weight, percent body fat, or appearance can become an all-consuming obsession for some athletes. As a result, athletes may develop eating disorders that jeopardize both performance and health. Although recognition of these life-threatening disorders is growing, appropriate intervention and treatment lag far behind the problem.

Eating disorders such as anorexia nervosa (self-imposed starvation) and bulimia nervosa (binge/purge syndrome) are defined as severe disturbances in eating behavior. Female athletes are at greater risk for eating disorders than are female non-athletes or males. Eating disorders are more prevalent in sports where appearance is judged, in weight-classification sports, and in sports that emphasize leanness to enhance performance.

Abnormal eating patterns do not always mean the athlete has an eating disorder. There is, however, cause for concern if an athlete shows the following signs or behaviors:

- Dramatic weight loss or extreme fluctuations in weight
- Claims to feel fat at normal or below normal weight
- Preoccupied with food, calories and weight
- Amenorrhea (loss of menstruation)
- Often eats secretively – avoids eating with the team
- Often disappears after eating, especially after a large meal
- Mood swings
- Excessive exercise that is not part of training regimen.

Do not attempt to diagnose or treat an athlete with an eating order. Anorexia nervosa and bulimia nervosa are very complex problems and require treatment by medical professionals. Your role should be to help the athlete contact a medical professional that specializes in treating eating disorders. If the athlete denies having a problem, but the evidence appears undeniable, consult with a physician who will assist you with the situation.

Several risk factors or triggers have been identified that are associated with the development of eating disorders in athletes. Compared to other athletes, athletes with eating disorders began both sports-specific training and dieting earlier, and felt that puberty occurred too early for optimal performance. Other triggers included prolonged periods of dieting, frequent weight fluctuations, a sudden increase in training volume, and traumatic events such as injury or loss of a coach. Many athletes who began dieting to improve performance reported that their coach recommended they lose weight. The risk for eating disorders was also increased when the weight loss was unsupervised.

While sports do not cause eating disorders, it is possible for an eating disorder to be triggered by a comment from a person who is very important to the athlete. All members of the athletic team family – coaches, trainers, athletic administrators and especially teammates – are significant people in an athlete's life. Consequently, these individuals have the power to be a helpful or harmful influence on susceptible adolescent athletes.

A great deal of caution must be given to the process of weigh-ins. The risk of triggering an eating disorder is increased when the numbers are used to set unrealistic weight goals for rapid weight loss, to browbeat or ridicule the athlete for gaining weight, or to impose excessive pressure on the athlete to show immediate weight loss.

Coaches and trainers must realize that their opinions and remarks about body weight can strongly influence an individual's eating behaviors. Commenting on someone's body size or need for weight loss (without offering guidance on how to do this healthfully) may trigger the development of an eating problem in vulnerable athletes.

As a coach, you can play an important supportive role in helping your athletes deal with the emotional and physical stresses of training and maintaining weight by:

- Providing your athletes with the basic nutritional information that appears in this chapter
- Not overplaying the impact of weight on performance
- Emphasizing that long-term, good eating habits and sensible weight control will optimize athletic performance
- Providing appropriate advice regarding weight loss/gain, rate of weight loss/gain, and target weight range.

CHAPTER 9

Organizing a Home Track Meet

High school athletes and the sport of track and field deserve well organized and smoothly run competitions. One of the primary duties of the coach is the planning and conducting of great home dual meets. The dual meet is the lifeblood of high school track and field. Events that are held on schedule, appeal to spectators, and offer challenges to the athletes show the sport at its best. The ability to host a well run home track meet is the measure of a coach's capability to organize.

A well-run, exciting and visually appealing home dual meet will go a long way in helping to build a high school track and field program. It will help recruit students who are attracted by the excitement, it will build support on campus from administrators and faculty who see a well-run, well-organized event, and it will certainly let visiting teams know they are in for a dogfight when they get off the bus and see this school is "serious" about track and field.

Hosting a good home dual track meet is not difficult, even for a new coach, if there is proper planning and organization.

How to Prepare for a Home Dual Meet

COACH'S CHECKLIST: PRIOR TO START OF SEASON

- ❑ Personally meet with the head of the maintenance department to give him or her a copy of the home meet schedule, and make sure he or she understands exactly what you will need for each meet (that includes restrooms cleaned, unlocked and stocked along with tables, chairs and the PA), what time everything needs to be set up, and what time will they be able to put everything away.

- ❑ Have athletes work to prepare their specific event area. Clean grass from the side of runways, add sand to pits, paint marks on rings, etc.

- ❑ Make a list of all the equipment (clipboards, stopwatches, rakes, crossbars, etc.) needed to host a home meet and give a copy to your athletic director and activities principal.

- ❑ Meet with the activities principal or athletic director to make sure starters have been assigned for all home meets. Also inquire whether or not your school has a "service hours" requirement for your faculty. Many schools require as part of the teacher contract that teachers work a certain number of hours each year at extra-curricular activities. Many teachers would rather work at a track meet after-school than a dance on Friday night.

- ❑ Send out personal letters to all alumni, parents, adult friends and faculty asking them if they would volunteer to work as an official at one or more of your home meets. Include a form for them to check off the meets they will help and an addressed envelope for them to return the form to you.

COACH'S CHECKLIST: AT LEAST TWO DAYS PRIOR TO THE HOME DUAL MEET

❑ Confirm officials' assignments. Have at least one adult official for each of the field events, three adult timers, three place pickers, and one adult to record the official results and also to keep a running score of the meet. No one on the home school's coaching staff or the opposing school's coaching staff should ever be an official in any capacity. All coaches should be left free to coach and organize their athletes and teams during the meet.

❑ Post assignments for individuals and groups (ie. throwers, jumpers, vaulters. etc.) for setting up and preparing facilities the day before the meet, the day of the meet and putting away equipment following the meet. During the meet, athletes should already have been assigned to be on the hurdle crew, block crew, pit rakers, result runners, or taking team splits. All athletes should have an assignment after they have completed their last event and warmed down. Those competing in the first and last events can help set up or put away equipment.

❑ Fill out field event cards (see sample). All field event cards should be completely filled out with the division, order of competition (ie, girls varsity, girls junior varsity, boys varsity, etc.) and the names of the athletes from the home school listed in alternating positions with your best performer last in flights of the field events. (Include first names for the announcer!)

All of the field event cards for a single event should be placed on a single clip board. A copy of the specific rules for that event should be taped to one side of the clipboard and a copy of the overall order of events should be taped to the other side.

Create a ready box for each field event. Place the clipboard with all the entry sheets in a "ready box." Also included in that "ready box" should be a tape measure, several pencils with erasers, distance markers (if needed), official flags, cones and the names of the athletes who are scheduled to help. When the officials arrive at the meet, their complete "ready box" can be handed to them and they are all set to go to their event.

❑ Prepare running event cards (see sample). All running event cards should be filled out with division and order information. Those cards should be placed in event order on a clipboard for the Clerk of the Course. A copy of the order of events should also be taped to the back of the clipboard.

Traditional High School Order of Events
- 4 X 100m relay
- 1600 Meters
- 100M/110m hurdles
- 400 Meters
- 100 Meters
- 800 Meters
- 300M hurdles
- 200 Meters
- 3200 Meters
- 4 x 400m Relay

CHECKLIST: DAY BEFORE THE MEET

❑ Stack hurdles at the appropriate height and locations (whichever your league order dictates be run first) on the side of the track at the appropriate markings. If the school situation dictates hurdles cannot be left out over night, place hurdles in the protective shed or garage already set to the height for the first hurdle event.

❑ Chalk the shot and discus landing sectors. Check your section or state's current rule-book for instructions.

❑ Turn over and rake the sand in all long and triple jump pits.

❑ Post the Order-of-Events in several locations around the track.

❑ Check all starting blocks to make sure pins are in place and oil them if each individual pedal does not move easily or the nuts are not loose. Place all starting blocks on block caddy (a shopping cart will do) and make sure there are several block hammers.

❑ Make sure there is a legal crossbar for each high jump and pole vault pit and they are placed in a location where they will be easily found.

❑ Gather all rakes and shovels in one location. There should be at least one broom for all field event areas to clean runways and rings. Additionally, there should be a minimum of one rake and shovel at each long and triple jump pit.

❑ Place benches in a clearly identifiable "bull pen" area so visiting team has a location to "camp out" during the meet.

CHECKLIST: MEET DAY

❑ Set out jumping pits, standards, crossbars, rakes, brooms and shovels at the pole vault, long and triple jump pits and brooms at the shot and discus rings.

❑ Supervise the dragging of the track and marking of the lanes, especially the relay exchange zones.

❑ Make sure the following are clearly marked.

- *Finish line*
- *Starting lines for the 110m hurdles and 100m*
- *Start staggers for the 200m, 300m hurdles and 400m*
- *Exchange zones and acceleration zones for the 4x100m relay and 4x400m relay*
- *Curved starting line for the 800m/1600m/3200m races.*

❑ Place all starting blocks by the start lines for the 4x100m relay and 100m hurdles (the first running events of the meet which require blocks).

❑ Place cones at the 100m break line for the 800m-1600m-3200m races (if applicable).

❑ Check out the PA system.

❑ Put flags around the finish line and all throw and jump areas to make sure no athlete accidentally walks into those areas during the meets. (Flags are also a great way to give the meet a little “pizzazz.” They are very inexpensive and coaches should include them in their annual budgets for the following year.)

CHECKLIST: PRIOR TO THE START OF THE MEET

❑ Be on hand with the captains of your team to greet opposing coaches and teams as they arrive. Answer any questions they may have and show them to their bull pen area. Ask them to fill in the names of their entries on the Field Event Forms.

❑ If your league or section rules dictate there be a coin flip prior to the meet to determine choice of lanes, make it special. Bring captains to the middle of the field, just as in a football game, and have the starter toss the coin.

❑ Confirm your officials’ and workers’ assignments as they arrive and issue them their "ready boxes."

CHECKLIST: AFTER THE MEET

❑ Supervise the collection and storage of all meet materials and equipment.

❑ Call in the results to your local paper. (If you want press coverage, you have to be prompt and consistent in calling in your results — win or lose!) Make note of outstanding performances, school records, multiple event winners, etc.

❑ Post the meet results and scoresheet for your team to look over before the next day's practice. Team and individual results of each athletes' performances in the meet, including split sheets for the distance races and relays and the field event series for the jumps and throws, should be posted before the athletes arrive for practice the next day.

❑ Meet with the entire team and briefly critique their performances and highlight any new PRs, school records, etc.

OFFICIALS' AND WORKERS' ASSIGNMENTS SHEET

Track Events

(Your School)	(vs.)	Date

Starter/Referee	Announcer	Scorer
Head Timer	Clerk of the Course	Result Runner

Timers & Place Pickers:		Starting Block Crew:
1st place	watch # ( )	lanes 1-2-3-4
2nd place	watch # ( )	lanes 5-6-7-8
3rd place	watch # ( )	Lap Cards:
4th place	watch # ( )	

4 x 100m Relay Inspectors:	4 x 400m Relay Inspectors:
1st exchange	front
2nd exchange	back
3rd exchange	

100m/110m Hurdle Crew:	300m Hurdle Crew:
flight 1	flight 1
flight 2	flight 2
flight 3	flight 3
flight 4	flight 4
flight 5	flight 5
flight 6	flight 6
flight 7	flight 7
flight 8	flight 8
flight 9	
flight 10	

Team Timers & Split Takers:

OFFICIALS' AND WORKERS' ASSIGNMENTS SHEET

Field Events

Pole Vault — Head Judge:

Bar Setter: Pole Catcher:

High Jump —

Head Judge : Bar Setter:

Long Jump — Head Judge:

Landing Judge: Pit Raker:

Triple Jump — Head Judge:

Landing Judge: Pit Raker:

Shot Put — Head Judge:

Landing Judge: Retriever:

Discus — Head Judge: Landing Judge:

Landing Judge: Retriever:

MEET MATERIALS CHECKLIST

Paperwork Materials [total number]

- ❒ Team Entry Lists [ ]
- ❒ Officials' Assignments Sheet [ ]
- ❒ Scoresheets [ ]
- ❒ School Records Sheet [ ]
- ❒ Track Event Entry forms [ ]
- ❒ Field Event Entry Forms [ ]
- ❒ Team Split Sheets [ ]
- ❒ Order of Events Sheets [ ]
- ❒ National Federation Rulebook [ ]
- ❒ CIF Track & Field Preview [ ]
- ❒ Check for Starter [ ]
- ❒ Emergency Phone Numbers [ ]
- ❒ Medical Release Cards [ ]
- ❒ Clipboards [ ]
- ❒ Pens [ ]
- ❒ Pencils [ ]
- ❒ Stopwatches [ ]
- ❒ Batons [ ]
- ❒ Measuring Tapes [ ]
- ❒ Marking Spikes [ ]
- ❒ Lap Cards [ ]
- ❒ Bullhorns [ ]
- ❒ Whistle [ ]
- ❒ First-Aid Kit [ ]
- ❒ Scotch Tape [ ]
- ❒ Red/White Flags for Relay Inspectors [ ]

TEAM ENTRY LIST

MEET	STARTING TIMES:	Field Events
DATE		Track Events

Boys' Varsity

4 x 100m A RELAY	1	4 x 100m B RELAY	1
	2		2
	3		3
	4		4
	alt.		alt.

1600 METERS	SHOT PUT
110M HURDLES	DISCUS
400 METERS	LONG JUMP
100 METERS	TRIPLE JUMP
800 METERS	HIGH JUMP
300m HURDLES	POLE VAULT
200 METERS	NOTES
3200 METERS	NOTES

4 x 400m A RELAY	1	4 x 400m B RELAY	1
	2		2
	3		3
	4		4
	alt.		alt.

TEAM ENTRY LIST

MEET | STARTING TIMES: | Field Events

DATE | | Track Events

❐ Boys' Frosh-Soph Entries		❐ Boys' Junior-Varsity Entries	
4 x 100m A RELAY	1	4 x 100m B RELAY	1
	2		2
	3		3
	4		4
	alt.		alt.
1600 METERS		SHOT PUT	
110m HURDLES		DISCUS	
400 METERS		LONG JUMP	
100 METERS		TRIPLE JUMP	
800 METERS		HIGH JUMP	
300m HURDLES		POLE VAULT	
200 METERS		NOTES	
3200 METERS		NOTES	
4 x 400m A RELAY	1	4 x 400m B RELAY	1
	2		2
	3		3
	4		4
	alt.		alt.

TEAM ENTRY LIST

MEET | STARTING TIMES: | Field Events
DATE | | Track Events

Girls' Varsity

4 x 100m A RELAY	1	4 x 100m B RELAY	1
	2		2
	3		3
	4		4
	alt.		alt.

1600 METERS	SHOT PUT
100m HURDLES	DISCUS
400 METERS	LONG JUMP
100 METERS	TRIPLE JUMP
800 METERS	HIGH JUMP
300m HURDLES	POLE VAULT
200 METERS	NOTES
3200 METERS	NOTES

4 x 400m A RELAY	1	4 x 400m B RELAY	1
	2		2
	3		3
	4		4
	alt.		alt.

TEAM ENTRY LIST

MEET	STARTING TIMES:	Field Events
DATE		Track Events

❐ Girls' Frosh-Soph Entries		❐ Girls' Junior-Varsity Entries	
4 x 100m A RELAY	1	4 x 100m B RELAY	1
	2		2
	3		3
	4		4
	alt.		alt.
1600 METERS		SHOT PUT	
100m HURDLES		DISCUS	
400 METERS		LONG JUMP	
100 METERS		TRIPLE JUMP	
800 METERS		HIGH JUMP	
300m HURDLES		POLE VAULT	
200 METERS		NOTES	
3200 METERS		NOTES	
4 x 400m A RELAY	1	4 x 400m B RELAY	1
	2		2
	3		3
	4		4
	alt.		alt.

ENTRY FORM FOR RUNNING EVENTS

EVENT ______________________ DATE ____________

MEET ______________________

Runs, Relays and Hurdles

CONTESTANTS	SCHOOL	**LANE OR** POSITION	NUMBER	ORDER OF FINISH

PLACE	NAME	SCHOOL	NUMBER	TIME	TEAM PONTS
1st					
2nd					
3rd					
4th					
5th					
6th					
7th					
8th					

ENTRY FORM FOR FIELD EVENTS

EVENT ____________________ DATE ____________________

MEET ____________________ FIELD JUDGE ____________________

Long Jump / Triple Jump / Shot Put / Discus

CONTESTANTS	SCHOOL	NO.	TRIALS						FINALS							
			FIRST		SECOND		THIRD		FIRST		SECOND		THIRD		BEST MARK	
			DISTANCE		DISTANCE		DISTANCE		DISTANCE		DISTANCE		DISTANCE		DISTANCE	
			FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.

PLACES	NAME	SCHOOL	NO.	DISTANCE		TEAM POINTS
1ST						
2ND						
3RD						
4TH						
5TH						
6TH						
7TH						
8TH						

COMPETITION FORM FOR FIELD EVENTS

EVENT ____________________ DATE ____________________

MEET ____________________ FIELD JUDGE ____________________

Pole Vault and High Jump

CONTESTANTS	SCHOOL	NO.	HT.	HT.	HT.	HT.	HT.	HT.	HT.	HT.	HT.	HT.	HT.	HT.	HT.	HT.

PLACE	NAME	SCHOOL	NO.	HT.	TEAM POINTS
1ST					
2ND					
3RD					
4TH					
5TH					
6TH					
7TH					
8TH					

TEAM/SCORE SHEET

TRACK MEET DATE PLACE

Summary

EVENT	FIRST PLACE PTS.		SECOND PLACE PTS.		THIRD PLACE PTS.		FOURTH PLACE PTS.		FIFTH PLACE PTS.		SCHOOLS							
	COMPETITOR	SCHOOL	COMPETITOR	SCHOOL	COMPETITOR	SCHOOL	COMPETITOR	SCHOOL	COMPETITOR	SCHOOL								
										TOTAL TEAM POINTS								
										TEAM STANDINGS								

TEAM SPLITS SHEET

DISTANCE SPLITS DATE

MEET

TEAM SPLITS SHEET

Sprints / Hurdles / Relays

❐ VARSITY BOYS ❐ F-S BOYS ❐ VARSITY GIRLS ❐ JV GIRLS

MEET DATE

	TIME		200	TIME
100m		400m		
200m		300m HURDLES		

100/110m HURDLES		4 X 100m RELAY A	TIME	4 X 100m RELAY B	TIME
		1.		1.	
		2.		2.	
		3.		3.	
		4.		4.	

EXCHANGES
E = Excellent
G = Good
P = Poor

4 x 400m RELAY A	200	400	4 x 400m RELAY B	200	400
1.			1.		
2.			2.		
3.			3.		
4.			4.		
FINAL TIME			FINAL TIME		

SAMPLE MEET CRITIQUE

THORNRIDGE TRACK RESULTS: 10th Annual TTT Track & Field Classic

• Friday, April 25, 1991 • Thornridge Field • Conditions 45°, NE winds 10-15 mph • Track 440 yards, resilite

SCORES:

1. THORNRIDGE	164	7. Bloomfield	20
2. Bloom	88	8. Riverside-Brookfield	20
3. Thornwood	66	9. Rich Central	14
4. ESL Senior	60	10. Springfield Southeast	12
5. ESL Lincoln	50	11. Springfield Lanphier	12

NOTES:

Congratulations! Our #1 State Ranking was NO FLUKE. And you can add Illinois'#2-3-4-8 and 11 rated teams to the list of believers!! In a field that included State Leaders in 8 events, plus 65 Individuals and 19 relay Teams ranked among the Top 10, your pride, your poise, your competitive savvy and your great performance were magnificent!!!

- All but 1 of our 21 entries scored!
- We scored in every one of the 18 events, except the Pole Vault!
  (2nd place Bloom scored in only 9 events)
- We won 7 events!
- Our lowest placing in 17 events was 4th!
- We scored enough points in the running events alone to win the meet!

From talking with you, we don't have a single individual or relay foursome that believes they have approached their maximum performance or potential, PRIDE-POISE-CONCENTRATION-MENTAL TOUGHNESS... We've only just begun. Our best is yet to come!

INDIVIDUAL SCORING: 10-8-6-4-2 all events (164 points/20 scorers)

20 Jim Lail	5.5 Sylvester Baugh
18 Mike Shields	5.5 Bob Spivey
18 Dennis Strong	4 Leon Fuller
16 Mike Kirk	2 Cliff Hall
5 1/2 Ali Leonard	2 Dexter Roberson
12 Glenn Jackson	2 Jim Ruddy
10 Dion Kemp	1 1/2 Perry Asauskas
10 Greg Benford	1 1/2 Dave Rickert
8 Mike Sullivan	1 1/2 Craig Capello
7 1/2 Larry Young	1 1/2 Lenny Kinnebrew

NEW PERSONAL RECORDS: THORNRIDGE ALL-TIME OUTDOOR RANKINGS IN [ ]

Mike Shields	22'3-1/2"	LJ [#3]	66'7"HJ[#4]	Dave Rickert	2:00.0	800m
Greg Benford	46'10"	TJ[#1]		Larry Young	1:57.1	800m [#9]
Dennis Strong	45'7-3/4"	TJ[#3]		Mike Kirk	8:59.7	3200m [#1]
Jim Lail	56'8-1/2"	Shot Put[#2]		Mike Sullivan	4:21.1	1600m [#7]
Bob Spivey	22.1r			Manny Perryman	10:13.5	Steeple [#7]
Glenn Jackson	21.8r			Bob Hines	10:22.3	Steeple [#10]

NEW SCHOOL RECORDS:

Varsity Triple Jump	46'10"	Gregg Benford
Varsity 3200m Run	8:59.7	Mike Kirk

How to Recruit and Train Adult Officials

It takes a cadre of competent, dependable adult officials to conduct a home track meet. Although administrators would find it unthinkable to use students to officiate at a school's football or basketball contests, there is widespread use of students to officiate track meets.

Not only does this practice trivialize and devalue the sport of track and field but it also can lead to questions of fairness and accuracy in determining places or marks. While students can and should be utilized to assist with the mechanics of conducting a track meet, it is irresponsible to allow the judgment and expertise of a high school student to influence or determine the outcome of even a single event.

SOURCES OF ADULT OFFICIALS FOR YOUR MEET

- **School faculty and staff.** Personally distribute to all school personnel a letter requesting their help and outlining how easy and fun it is to be an official. Don't leave out anyone. Maintenance workers, cafeteria staff, secretaries and campus security officers are all great sources that are usually never tapped to help.
- **Parents of your team members.** Distribute an officials' sign-up sheet at your preseason parents meeting or give sign-up sheets to your athletes to take home. Impress upon the parents how important adult officials are to making your meets quality events. Tell athletes to include older adult brothers, sisters, aunts and uncles.
- **Team alumni.** Make a pitch to all your seniors who plan on staying in your area after graduation. Many will be eager to stay involved with your program as a meet official.
- **PE or coaching majors** from your local community college or university. Put in a call to the school's Physical Education Department chairman. Many of these programs require their students to serve internships at local schools or to provide community service.
- **Coaches from other sports on your campus.** No one knows better how important it is to have a well run athletic contest than another coach. Appeal to them to come help. They usually enjoy seeing their own athletes in a different sport. In addition to you contacting the other coaches, have the athletes on your team who do other sports ask those coaches also. Don't forget to ask the walk-on coaches who coach other sports.

TRAINING YOUR OFFICIALS

Each spring it is recommended there be a *mandatory preseason meeting* with all your officials: It would be nice to have pizza and sodas and make it somewhat of a social gathering; however, you should also do the following.

- **View a video** on track and field officiating for meet volunteers. (Contact your local USATF office for their instructional video.)
- **Distribute and discuss any new rules,** rule interpretations, or procedures which will affect officiating in the coming season.
- *Ask for and answer any specific questions* regarding officiating or your home-meet procedures.
- *Record* your officials' preferred officiating assignments.
- *Provide a one-page summary of the rules* and judging instructions for each official's assignment preferences.
- *Recommend your officials become USATF-Certified.* Arrangements can be made with local USATF association to provide your officials with a free one-day workshop, culminating with an open book test on the rules of track and field officiating. With USATF certification your officials can qualify to officiate the other Championship meets and even major USATF meets throughout the season.
- *Ask your officials to recommend others* who might be interested in becoming officials for your home meets.

KEYS TO WELL-OFFICIATED TRACK MEETS

- The key to having a full complement of officials is notifying them of their assignments and time to report well in advance of the meet. This also gives you time to find replacements and provide them with the necessary instruction and information.
- The key to conducting a quick-paced track meet which runs on schedule is having a competent Clerk of the Course – this should be your most competent and experienced official. The COC assembles the participants for each running event in a staging area located near the starting line and gives them their lane assignments and final instructions prior to the race. This enables competitors to take their starting positions immediately upon the completion of the prior event and saves the Starter from having to take the time to position and instruct the participants for

every race. While one race is in progress, those in the next race should be waiting to take their starting positions, while those in the following race are receiving instructions from the COC.

- The key to having an efficiently run finish line is a well informed and experienced Head Timer/ Finish Judge. The Head Timer assigns the places to be picked and timed by the other timers. The easiest places to pick and time are first and second, so the most experienced timers should be assigned third, fourth, fifth, etc. The Head Timer also coordinates each race with the Starter, and records the results and times on the results sheet after each race.

- The key to making the track meet a spectator event is having a good announcer. Your PA system should not be used to call participants to the starting line for each race. That is an administrative function, which should be performed by the Clerk of the Course, armed with a bullhorn.

  The announcer should be knowledgeable about track and field, enthusiastic, and comfortable in front of a microphone. He or she should be able to call each race and identify the leaders, read split times, and announce the unofficial winners and times immediately upon the completion of the race.

  The announcers should keep spectators informed about what is happening in the field events and the running team scores during the meet. He or she should also be equipped with knowledge or information to relate performances to your school and stadium records, all-time lists and seasonal league and state bests.

  Look for potential announcers among those who announce your football and basketball games and faculty members in your English, drama and debate departments.

YOUR MEET REFEREES

The Starter is the Meet Referee unless someone else is designated as such. ***The Referee's responsibilities are the following:***

- Follow and enforce the rules of track and field established by the National High School Federation, the state federation, the local section and the league.
- Interpret and apply all rules governing the competition.
- Serve as the Agent of Appeal for all protests.
- Resolve any question or dispute during the meet which is not covered by the rules.
- Disqualify contestants. All other officials can only report violations to the Referee for a ruling.
- Verify and sign any record applications.

CHAPTER 10

Training Sprinters

Track and field is mostly a sprint sport. All things being equal, speed usually wins the race. The pure sprint events include the 100 meters, 200 meters, 400 meters, and the 4x100 and 4x400 relays. Sprint speed is also a crucial component of the hurdles, horizontal jumps, pole vault, and middle distances. To have winning teams, coaches must be able to teach and train their athletes to run with speed.

A Philosophy for Coaching the Sprint Events

Basketball coaches have been known to say, *"You can't coach height, so you better recruit it!"* Similarly, coaches and athletes in all sports have surrendered to the belief that speed, like height, is a trait predetermined by genetics and something that cannot be significantly improved by training. The truth is, speed can be significantly improved through training and an awareness of the essential techniques common to the fastest sprinters. The development of running speed is not simply a gift of genetics. *Speed is a skill,* and it can be learned and developed by athletes at every level of competition.

Our genetic endowments *influence* everything we do; however, we are not limited to the level of abilities demonstrated by our ancestors. The depth of performance potential waiting to be discovered in us all is limited only by our attitudes. The dramatic improvement of athletic skills and the acquisition of new ones are within the grasp of any performer. Success is found where coaches demonstrate these expectations for the athletes they coach.

Regardless of the race distance, the single most important performance component is speed. When distance runners cross the finish, they are not commended for their great aerobic capacity. The hurdler doesn't earn style points for technical merit or grace of execution. What matters most in races of all distances is the *speed* demonstrated from the start to the finish line; therefore, *every* track athlete should have a speed development program regardless of his or her event.

In the absence of a team-based speed-development program, excellent sprint prospects can often be overlooked. Coaches should not expect to see the skill of speed demonstrated by all of their best candidates for the sprint events before learning has even begun. If athletes do not show obvious sprinting ability at an early age or on the first day of training, coaches should not necessarily direct them toward some other event specialty. Over time, the ability to run faster and to sprint capably can be developed. Labeling athletes before their training has begun and limiting them to middle-distance and distance events can be a tragic error.

The Speed Dynamics® Approach to Sprint Training

SPEED DYNAMICS® is a moniker given to a new philosophy for developing sprinters. The traditional approach to training sprinters has emphasized only one of the body's physiological systems: the muscular system. The assumption has been, *"If you make athletes stronger, they will become faster."* While the importance of strength and power development should not be understated, strength gains will not produce proportional improvements in speed. In other words, doubling the weight you lift will not cut your race time in half.

MULTI-TRACK TRAINING

Since many physiological components contribute to faster running, many training targets demand attention, including:

- **Strength and power**
- **Dynamic mobility**
- **Neuromuscular coordination**
- **Event specific skill**
- **Energy system fitness**

Though the primary training emphasis will change from day to day, some attention should be given to each of these components in every training session. One of these training targets will require a special daily emphasis.

The **nervous system** is the single most important contributor to speed. Working as the body's control network, the nervous system is responsible for every subtle and obvious movement the athlete makes. It is the nervous system, which carries the intricate commands to each muscle, that determines when and in what order muscles contract. A powerful engine is useless if the ignition wires don't send the right signal to the cylinders at the proper time and in the proper order. In the same way, muscular strength is of no benefit if the nervous system does not coordinate its work. Consequently, training the neuro-muscular system is the foundation to build to high-level performance.

The neuro-muscular system can be programmed much like a computer. With training, a coach can create an auto-pilot in the athlete that will guide him or her to faster finishing times.

The body is an amazingly adaptable mechanism. It will do whatever is asked of it, provided it is done so in a language it understands. The only programming language the nervous system understands is *repeated rehearsal.* As an athlete moves through any activity, the body works to make most efficient the muscle sequencing and firing rate for the chosen activity. As an athlete repeats an action or movement, the body locks-in the intricate muscle commands responsible for the task.

PRACTICE MAKES PERMANENT

We are all familiar with the cliché *"Practice makes perfect."* In the science of speed development, however, it is more precise to say *"Practice makes permanent."* This is especially true where the neuro-muscular system is concerned. Since the nervous system cannot distinguish between the results an athlete desires and what an athlete actually rehearses, it will simply master the movements done most often. So *whatever is done in training* becomes permanently etched into the neuro-muscular system. Athletes must, therefore, avoid doing lazy drills, lackluster exercise routines, or general training that strays too far from the movements specific to their event specialty.

REDUCE THE PURSUIT OF SPEED TO A MEASURABLE, DAILY MISSION

The primary objective, *the mission,* each day in training should be to reduce, for every stride taken, the time spent on the ground or in the air by just one one-hundredth of a second. Whether in the 40-yard dash or the marathon, reducing the time an ahtlete spends on the ground or the time he or she spends in the air is how gains in speed are made. Though seemingly incidental increments, the results of such a change will produce profound improvements in finishing times.

For instance, in the 100-meter dash, as many as 50 strides are required to reach the finish line. If the time spent on the ground or in the air for each stride taken is reduced, by just one one-hundredth (0.01) of a second, the improvement at the finish is a dramatic five-tenths (0.5) of a second. Such an improvement is the difference between being an average sprinter and a candidate for a college scholarship.

THE WHOLE / PART / WHOLE TEACHING METHOD

When the novice sprinter stands over starting blocks for the first time, the finish-line can seem to be a very long distance away. During the race, the athlete will experience many different sensations and demands.

For a sprinter to excel, the race must be broken down into easily learnable parts. Sprinting is usually thought of in terms of maximum velocity sprinting; however, a sprinter's top speed will last for a very short duration. Over the course of the entire sprint race, many other significant components can be identified. After all components are mastered individually in training, they can be reassembled to produce a successful race.

THE NINE COMPONENTS OF THE SPRINT RACE

- **The Warm-up**
  The competition warm-up is often overlooked when evaluating the entire scope of a sprint race; however, it is essential for optimal performance, readiness and injury prevention. While the purpose of the competition warm-up is to optimize readiness for racing, the purpose of a training session warm-up is quite different.

  The training session warm-up can be a most effective means of training – not merely a preparation for training. Later, several different training session methods including the *active-dynamic,* the continuous, and the *segment* variety will be identified.

- **The Start**
  The start is a series of complicated motor skills that, when executed properly, produce the force necessary to overcome inertia and begin acceleration. Often occurring in less than one second, the start includes *reaction time, force application and the first two running steps.*

- **Acceleration**
  This performance phase is the first of two links between the initial movements of the start and maximum velocity sprinting. The initial eight to ten steps represent this phase. The sprint mechanics of acceleration are very different from maximum velocity sprinting. The body position desired here is similar to the posture found when pushing a car or pulling a sled.

- **Transition**
  This racing phase completes the link to maximum velocity sprinting. It must be differentiated from pure acceleration because of gradual and subtle mechanical changes in the running stride. Transition skills are among the last lessons learned by the developing sprinter.

- **Maximum Velocity**
  Usually achieved after four-to-five seconds of utmost effort, the maximum velocity

phase of the sprint race is characterized by the highest stride frequency and the most optimal stride length. The duration of maximum velocity is often as short as **two to three seconds.** Maximum Velocity should be the first training focus.

- **Speed Maintenance**
  What some refer to as the deceleration phase, should be refered to as *speed maintenance.* This is a lesson in neuro-linguistics. Coaches should never suggest to their sprinters, even subtly, they should expect to slow down at any time in a sprint race! Rather, the performance objective should be to *maintain* as much top speed as possible. Of course, it is likely that a gradual decline in velocity will occur due to various elements of fatigue.

- **Finishing Form**
  Many races have been lost or qualifying standards barely missed because of the lack of finishing technique. Perfecting this skill can reduce a sprinter's time by that critical one or two one-hundredths of a second needed for victory.

- **Coast and Stop**
  The truth is the majority of sprinting injuries do not occur at the start or during the race. All too often, athletes turn off their concentration while passing the finish line and allow the ground to apply abrupt breaking forces to their legs. Proper coasting and stopping techniques are essential in preventing post-race trauma and injury.

- **Restoration and Recovery**
  Sprinters are routinely required to run several events during the course of a single track meet. After the race is run, the sprinter's work is not finished. It is necessary to bring the body's physiological systems back to the basal level quickly and then effectively prepare for either the next race or tomorrow's training session.

Testing and Evaluation

It is common for coaches to create a single master training plan for all their sprinters. Certainly, some commonalties do exist when the training programs of sprinters are compared; however, only by respecting and addressing the unique qualities and objectives of each athlete can coaches lead an individual towards achieving his or her highest levels of performance.

Just as a physician examines each patient to properly attend to individual needs so must the coach explore the personal capacities of each athlete under his or her charge. Before a training program can be developed, coaches should *"test for success"* and look past obvious, surface-level data to explore the depths of undiscovered potential. There are several tests that examine both psychological and physiological performance factors.

PSYCHOLOGICAL EVALUATION

Even if a coach creates a perfect training program to develop the physiological potential of a particular athlete, little will be accomplished if that athlete's goals and perceptions do not line up with those of the coach. If a coach wants to win a national championship, but the athlete is only looking for a better fit of his or her bathing suit, the conflicting objectives will make for a difficult and unsuccessful relationship.

The evaluation process should begin with the completion of an *athlete's questionnaire.* This questionnaire provides a coach with valuable insights that serve to identify characteristics unique to the athlete. The questionnaire should include sections that explore relevant statistical, personal, medical and volitional data. By understanding the unique circumstances surrounding the person, not just the performer, coaches can match appropriate training methods to individual needs.

STATISTICAL DATA

The survey process should begin with questions such as address, telephone number, date of birth, grade-point average and college-board scores. Class schedules should also be noted. It is also helpful to list shoe and uniform sizes in this section. With a master list of this information on hand, emergency equipment problems can be minimized. Many more questions of this type can be included in this area of the questionnaire.

One of the most important inquires from this portion of the questionnaire is the determination of *training age.* Training age is a measurement of athletic experience expressed in years. It is determined by totaling the amount of time spent in a structured athletic program.

The athlete who participates in sport for only three months per year, over a total of four seasons has a training age of "one." Though a four-year veteran, a training age of one-year suggests this athlete is still in athletic infancy. This important characteristic should greatly influence the *training loads* prescribed for any performer.

PERSONAL DATA

This section of the questionnaire examines the home environment, family influences, personal achievements and employment status of the individual. It should be determined if one or both parents are in the home, or if the athlete lives with other relatives. How many brothers and sisters does the athlete have and what are their ages? Are the athlete's parents or siblings athletes? Does the athlete have a nickname? Is the athlete a member of any clubs or organizations? Does the athlete have a part-time job?

Other areas of the athlete's life that may have provided opportunities for success should be explored. Has the athlete earned any awards in academics, art and drama or in other sports? This data serves to identify the intangible qualities the athlete may possess as demonstrated in other activities. Demonstrated qualities such as determination, dedication, persistence, loyalty and other virtues can transfer to any athletic endeavor.

MEDICAL DATA

A medical history should be included in this questionnaire. The family doctor's name, date of last examination, any prescribed medications and allergies should be listed. Any injuries, especially those suffered in athletics, should be documented with their diagnosis, therapy and current status.

VOLITIONAL DATA

Volition is defined as *"The act or power of the will."* This section should attempt to discover the motivation, tolerance and objectives of the athlete. It is best to begin by simply asking, *"Why are you here?"* The wide range of responses to this question may be a surprise. Some athletes participate because they are looking to earn a scholarship, while others are attracted to being part of a team. Others may be compelled to participate by pressure from their parents and friends. They may have joined the team simply out of love for the sport or to improve their fitness. And of course, there are always those who are not really sure why they signed up! Perhaps they stumbled in by chance or out of curiosity.

Novice athletes who are unconvinced of their athletic potential will demand a special rapport with the coach. The athletic infancy of a novice will require not only reduced training loads, but special encouragement as well. The experienced athlete with state-meet aspirations will likely have a very different relationship with the coach, as well as significantly more challenging workloads.

FIELD TESTS

The test course will consist of an acceleration zone and a **30-meter timing zone**. Novice athletes should use a 15-meter acceleration zone, while more accomplished athletes can use a fly zone of 20 to 25 meters.

15 - 20m	**30 m**
- - - - - - - - - - - - - - - - - - - -	————————————
ACCELERATION ZONE	TIMING ZONE

- **Evaluating Maximum Velocity**
  The **30-meter fly test** evaluates the maximum velocity capacity of the athlete. The athlete is instructed to sprint through the acceleration zone and the 30-meter action zone with maximum effort. He or she is timed, however, only from the start of the 30-meter test zone to its finish.

  When the distance run (30 meters) is divided by the time recorded, the answer reveals the maximum velocity of the athlete in terms of **meters-per-second** (the number of meters traveled in one second, while sprinting at full speed). If the split time were 3.0 seconds in the fly 30 test, the **maximum velocity** of the performer would be 10.0 meters-per-second.

  To date, the world's fastest men and women have posted top marks of 12 and 10 meters-per-second respectively. Developing athletes will register values close to 10 meters-per-second for boys and 8 meters-per-second for girls.

- **Evaluating Acceleration**
  Acceleration skills can be evaluated by conducting a **standing 30-meter dash.** Athletes should be instructed to sprint from the start of the 30-meter timing zone through the finish beginning from an upright, standing start. The watch should be started from the instant the rear foot leaves the ground, and stopped when the torso crosses the end of the timing zone. Only experienced athletes of at least college-level should use a crouched start for this test.

  The acceleration skills of an athlete can be judged by reviewing the differences in performance between the **30-meter fly test** and the **standing 30-meter test.** Subtracting the fly 30-meter time from the standing 30-meter time reveals the *acceleration differential.* Accomplished sprinters will register a 1.0 second differential, while a developing athlete's mark will fall into the 1.4 to 1.6 range. Lowering this differential is the best evidence of improvement in the acceleration phase.

- **Evaluating Sprint Endurance**
  Sprint endurance can be determined by adding a second 30-meters to the existing timing zone for a **60-meter fly test.** Athletes should be instructed to sprint through the acceleration zone and both 30-meter timing zones. The test effort should include a split time at 30-meters and a finish time at 60-meters.

  Sprint endurance can be evaluated by comparing the performance times recorded in both 30-meter test zones. If the first 30-meters was covered in 3.0 seconds, the second zone should measure no more than 3.09 seconds for the elite sprinter (a 3% variance). Developing sprinters may show a differential between the 30-meter splits of 5 - 6%.

- **Evaluating Speed Endurance**
  The objective here is to measure the athlete's resistance to fatigue with a **block-start or standing 150-meter test run.** From the recorded time, the mean or average velocity run over this distance can be calculated by dividing 150 meters by the finish time. If the athlete posts a mark of 20 seconds, the *mean velocity* is 7.5 meters-per-second.

  A primary training objective should be to narrow the gap between a sprinter's mean and maximum. If the athlete has shown a maximum velocity of 10 meters-per-second and a speed endurance mean velocity of 7.5 meters-per-second, we can conclude that the athlete's current speed endurance capacity is 75% of maximum speed. We will want to increase this percentage through training.

- **Evaluating Special Endurance**
  Special endurance can be evaluated by conducting a **timed 300-meter run.** Special endurance reflects an important metabolic capacity of the sprinter. Once again, the mean velocity is calculated. For example, if the athlete's time was 40 seconds, the mean velocity for special endurance is 7.5 meters-per-second. If the maximum velocity of the athlete measured 10 meters-per-second, we can conclude that the special endurance of the individual is 75%. Again, we will want to increase this value through training.

MEASURING AEROBIC CAPACITY

Aerobic or work capacity refers to the amount of work an athlete is capable of producing. We can also identify the capability of expanding a sprinter's range of performance to include middle-distance events with this test. The simplest aerobic capacity test is a **12-minute run** recording the total distance covered during that time.

Developing athletes will typically travel 2200 to 2600 meters (5.5 to 6.5 laps of a 400m track) in 12-minutes. Accomplished sprinters will cover 2800 to 3200 meters (7-8 laps) in this test. This test is most appropriate, however, for the developing athlete. The results of this run should also be expressed in terms of the **mean velocity** achieved. For example, if the athlete covers a distance of 2400 meters during a 12-minute run, endurance capacity is : 2400 meters divided by 720 seconds (12-minutes) = 3.33 meters-per-second.

This mean or average velocity should then be used to evaluate current endurance capacity and to measure improvements over time.

- **Measuring Elastic Strength**
  The **vertical-jump test** measures elastic strength. From a squat jump, the athlete extends vertically covering as great a vertical distance as possible. The jump height can be calculated by attaching a measuring tape to a wall. The athlete should begin with arms outstretched overhead and noting the starting point. When the jump is executed, total distance covered above the starting mark is recorded. It is essential that both arms reach upward simultaneously to assure consistent results.

  A developing female athlete will record marks between 46cm and 56cm, while her elite counterpart will tally 61cm to 71cm. The developing male will demonstrate 61cm to 66cm, while the elite male will post a jump of 71cm to 82cm.

- **Evaluating Elastic Power**
  The **5-stride bounding test** will provide insights into an athlete's power capacity. The athlete should be instructed to stand with feet aligned, and starting off both feet, to bound forward for a total of 5-strides. The object is to span as great a distance as possible. The best bounders will show high levels of negative foot speed, stable joint systems, and little front/side distance at landing.

  Expect developing women athletes to show marks of 11.5 meters to 12.8 meters, while elite women will show a range of 12.8 meters to 14 meters. Developing men will bound between 12 meters and 13.5 meters, while elite men will post bounds of 14 meters to 15 meters.

Coaching the Mechanics of Sprinting

The process of achieving faster sprint times begins with training to improve the sprinting mechanics of the athlete. This can be achieved through carefully choreographed drills. With repeated rehearsal, these sprint drills will create permanent patterns of movement which work like an auto-pilot for the sprinter.

DORSIFLEXION

A key principal to understand is the importance of **dorsiflexing the foot** *(pulling the toe-up)* while sprinting. A visible technique in all great sprinters, this important joint position is exhibited throughout proper mechanics. It can be demonstrated with this exercise: Raise your arm as if to flex your biceps, but keep the muscle relaxed. Place your free hand on its bicep. Now turn your wrist-in *(the "walk-like-an-Egyptian" pose)*. What happens to the muscle? It seems to disappear. Now turn your wrist back to its original position. The biceps comes back to life! This exercise illustrates how *joint positions determine muscle recruitment.* If your wrist is in the wrong position, your bicep simply turns off and is useless to you.

In the same way, ankle positions determine which muscles are active during running. When the ankle is *dorsiflexed* so the toes are pulled up, you can feel the gastrocnemius (calf) muscle go to work. When functioning, it allows an athlete to pull the leg through the recovery phase (heel-to-butt) in less time during the running stride. The result is **less time wasted in the air;** therefore, a key mechanical principle in running at any speed is *keeping the toe up!* When that same leg reaches to land on the next stride, once again the ankle should be dorsiflexed. With the toe-up at landing, the ankle works like a spring-board and muscle elasticity moves the athlete off the ground in less time. Less time on the ground or in the air gets every runner to the finish line faster.

DRILLS FOR SPEED

- **Ankling Drill**
  Objectives: To limit time spent on the ground and to develop an elastic response in the ankle joint.

  Beginning with a walk, with each small step taken, step no higher than the top of the opposite ankle. Emphasize the ankles remaining *dorsiflexed* throughout the drill. The look of the drill is that of a quick-shuffle action. As tempo increases, an elastic response in the ankle increases. Arms and legs should be active with the elbows loosely positioned at 90-degrees. In ankling, horizontal speed is insignificant. The focus is on *limiting the time spent on the ground.* Athletes should be instructed to listen to their steps and try not to make a scuffing noise with their shoes.

Verbal Cues: "toes up," "quick feet," "hot ground," "fast shuffle," "spring-board action."

- ***High-Knee Butt-Kick Drill***
  Objective: To reduce the time necessary for recovering the foot from the ground to the buttocks by using the gastrocnemius muscle to fold the calf tightly against the hamstrings.

  The technical focus of the butt-kick drill is the ankle, which should be dorsiflexed throughout the exercise. Beginning with a jog, proper ankle position should be maintained as the heels quickly fold-up under the buttocks. A contact "slap" should be audible. Special care should be taken to ensure the knee is lifted and the thigh approaches a parallel position as each heel slaps underneath the buttock. Once again, avoiding scuffing the running surface is key. This drill is an excellent exercise to simultaneously improve a sprinter's arm-action by driving the elbows back quickly in sync with the legs.

  Verbal Cues: "elbows back," "toes up," "heels up," "hands like hammers."

- **"A" Drills**
  Objective: To improve efficiency of movement and to establish the best mechanical position in which to begin the next stride.

  The names we tend to give exercises can distract us from proper execution. *"High-knee Drills"* are perhaps the best example. Getting the knee high isn't sufficient; therefore, the "A" series avoids any confusion with the use of a generic name. In the "A" Drill, the toe, heel and knees should come up simultaneously. The calf should be kept tightly folded against the hamstrings and thigh parallel to the ground as the foot steps over the opposite knee. To complete the stride cycle, the thigh is then driven back down to and then past the perpendicular position at landing and the foot pulls the ground back underneath the hips.

  The "A" Drill should begin with a *march*. As skill increases, the march can transition into a *skip* and then a *run*. The shoulders should remain above the hips throughout the "A" drill, and the athlete should avoid tilting the pelvis back like a drum major to make it easier to lift the knees.

Verbal Cues: “toe up-heel up-knee up”, “step-over the opposite knee.”

- **Fast Claw Drill**
  Objective: To re-pattern neuro-muscular movements and create improved vertical leg speed.

  This exercise is performed one leg at a time. It begins with the athlete standing erect with the thigh of the active leg blocked in a parallel position, the toe should be up and ankle cocked, and the heel of the support leg off the ground. To begin, the thigh is driven down to a perpendicular position as fast as possible, and the foot recovered back up as quickly as possible. The knee joint remains loose allowing the lower leg to swing out naturally. The cyclical action used in previous drills applies here. The Fast Claw Drill can be performed continuously, for a designated number of repetitions or on command.

- **“B” Drills**
  Objective: To reduce breaking forces at ground contact by generating high levels of negative (backward) foot speed. *(Can also be used to simulate the sensation of hurdle clearance.)*

  The single characteristic that most distinguishes developing sprinters from elite sprinters is the ability to produce *negative foot speed.* This exercise allows athletes to experience the sensation of pulling the running surface back underneath them. When this negative or backward foot speed is at least equal to the velocity of the hips traveling forward, little deceleration occurs as the foot lands.

  The “B” Drill begins with the same action as the “A” series with the toe-up, heel-up, knee-up and the foot stepping over the opposite knee. When the thigh blocks in a parallel position, it should be quickly re-accelerated back to a support stance. In the “A” series of drills, the speed of the leg through the stride cycle is the same. In the “B” Drill, the speed of thigh driving back toward the ground is noticeably faster than the recovery action. The front-side movement dominates the exercise.

  Contrary to popular opinion, it is not necessary for the sprinter to try to kick-out the lower leg in front of him or her. This action will occur naturally as a result of the quick change of direction in the thigh position.

Unlike the "A" series, "B" Drills should begin with a full skip and progress to the march that requires high levels of strength, flexibility and skill. The full series of "B" Drills includes a *full skip* with both legs active, *a single-leg "B" skip, a "B" run a*nd *a "B" march.*

Verbal Cues: "step over," "drive the thigh," "grab back."

- **Straight-Leg Shuffle**
  Objectives: To develop high levels of negative foot-speed and increase specific strength in the hamstrings and gluteus.

  In this exercise, athletes should be told to forget they have a knee joint. Keeping the toes up, ankles dorsiflexed and shoulders positioned in front of the hips, the leg swings straight out, then quickly changes direction and drives back into the running surface. Athletes should feel the hips projected forward as they attempt to pull the ground back underneath them. Once the basic movement is mastered, the *straight-leg shuffle* can evolve into a straight-leg bounding action by applying greater negative force at each landing. Proper running posture should always be maintained.

  Verbal Cues: "tear back the track," "pop the hips through."

Coaching the Maximum Velocity Phase

Seeking improvements in the maximum velocity of the athlete should be the first training focus with sprinters. Gains in this performance phase are the foundation of success in sprinting. Though the duration of this segment of a sprint race is often only two to four seconds, its impact on the finishing result is profound. The training objective is to break through the dynamic stereotypes which limit performance and create new, improved motor patterns in the athlete. These new motor patterns will result in improved efficiency of movement, mechanical gains in force output, and a reduction in time spent on the ground and in the air.

In strength training, we understand that as an athlete's maximum capacity increases, every other degree of strength will benefit as well. Just as we design training in the weight-room based on a percentage of an athlete's maximum strength capacity, so should we address speed development. With improvements in our sprinters' maximum velocity, measurable benefits will filter down to all their other movement skills. Since the maximum speed capacity of an athlete relies less on strength and power than other racing phases do, it makes sense to begin this training early in the season when strength is lacking. This begins with the most important drills the sprinter will ever perform.

FAST-LEG DRILLS

Objectives: To develop vertical leg-speed and neuromuscular coordination. This series is designed to improve the maximum speed of the athlete without any emphasis on horizontal movement. Here the focus is on improving the vertical component of sprinting.

- **Four-Step Fast-Leg Drill**
  Horizontal speed is unimportant so this drill should begin with a slow jog, recovering *one leg only,* up as quickly as possible and back down again four times as quickly as possible. As always, emphasize "toe-up, heel-up, knee-up, step-over-the-opposite-knee." The sprinter should feel as if he is leaving the support leg behind, never stepping forward with it. This drill is performed with sets of four repetitions separated with a few jogging strides using one active leg over a distance of 30 meters, and returning to the starting point drilling the other leg. It can progress to distances of 50 to 70 meters.

- **Alternate Fast-Leg Drill**
  Once both the left and right side fast-leg drills are mastered individually, the skill can be enhanced with an alternate fast-leg routine by taking two steps and fast-leg the other side. As skill increases, the jog progresses into a moderate run. The legs should function autonomously from the upper body. No jerking of the torso should occur during the fast-leg action.

- **Continuous Fast-Leg Drill**
  Instruct athletes to imagine one leg is dragging a weight from the ankle. *(The sensation is not unlike wearing a ball-and-chain as a prisoner might.)* The drill starts with a walk, with the support leg lagging behind, and fast-leg action on the other side on every stride. Balance is maintained by keeping the arms and legs synchronized.

- **Command Fast-Leg Drill**
  In this drill athletes move in a slow jog down the track. The coach shouts the number of fast-legs to be performed in a consecutive effort. The athlete performs the quota, and then returns to a jog waiting for the next number of fast-legs to be performed. One, two or three reps are appropriate. The side on which the fast-leg is performed can also be designated, along with the number of reps desired, e.g. "2 left... 1 right... 3 right."

- **Complex Fast-Leg Drills**
  You can further enhance fast-leg skills by using the routine with other drills like ankling, butt-kicks and straight-leg bounding.

TRAINING AT SPEED

"Speed-work," as commonly defined, does not fit into the Speed Dynamics® philosophy. Traditional speed-work sessions with bouts of 10-to-30 second runs do not replicate the actual short duration of maximum velocity sprinting. Since the neuromuscular system can only fire at maximum levels for only two to three seconds at a time, speed work for sprinters must reflect this reality.

- **Fly-In Sprints**
  Fly-in sprinting is an excellent training tool to develop maximum speed. The training course should consist of a "fly" or acceleration zone of 15 to 25 meters, and an "action zone" of **20 to 40 meters** marked with traffic cones or hurdles on either side of the dedicated lane(s). The objective of these fly-in sprints is to capture the maximum velocity phase of the sprinter's race so specific improvements can be made. The speed of the run increases gradually through the fly zone as the action zone is approached. The action zone represents the maximum velocity phase of a sprint race. Transit time through the action zone should never be more than **2 to 4 seconds.**

  The length of the action-zone should be based on the maximum velocity capacity of the athlete as measured in the fly 30-meter test. The developing sprinter will typically begin training with an action-zone of 20 meters. More accomplished sprinters can utilize a 30-meter action-zone. In time, the length of these respective zones can increase to 30 meters for the developing sprinter and 40 meters for the accomplished sprinter.

During acceleration, the sprinter should breath normally, but when the action zone is reached, the athlete should hold his or her breath for the first four to six strides and sprint as fast as possible through the end of the action zone.

The coach should always cue the specific mechanics desired during maximum velocity sprinting. Since the time available to cue the athlete and prompt a response is short, cues should be composed of no more than two words or syllables. "Toe up," "step over," "grab back" are best.

- **Breath Control**
  One of the unusual nuances of this training is the breath control previously described. Research has shown holding one's breath actually increases the ability to apply force. This action, which has been traced back to the "fight or flight reflex" of our ancient ancestors, causes physiological changes advantageous to explosive movement to take place. Evidence suggests that instinctively, we have always been aware of this advantage. From the attempt to pry loose the stubborn lid on a jar, to the Herculean effort of a maximum lift in the weight room, holding one's breath makes the task easier to perform by increasing thoracic and interabdominal pressure which acts as an "air-splint" for the spine. Stabilization of the spine improves the ability to apply force. Furthermore, research shows that breath control increases intra-cranial blood pressure, which leads to an improved ability to recruit motor units.

  In short, the ability to apply big forces to the track improves when holding the breath; however, breath control is useful only if it can be implemented practically. The use of breath control in fly-in sprints and the Ins-and-Outs training to be discussed later, will lay the foundation for a new race model over the course of the season. This model will allow new sprinting skills developed in training to be transferred to competitive sprinting.

  Another advantage of using breath control techniques is the improved awareness it prompts in the sprinter. Holding one's breath is a dramatic cue that signals the athlete a special focus is now required. It also creates a definite sense of urgency about reaching the normal breathing check-point. Coaches will find their sprinters will no longer coast through a sprint session without the attention to detail required for success in these events.

- **Sets, Reps and Recovery Notes for Maximum Speed Training**

  Fly-in sprints should be introduced with a single set of three repetitions. As training continues, this routine can progress towards a total of three sets with three repetitions in each set. For the developing sprinter, total volume should not exceed 500 meters per week. For the accomplished sprinter, 800 to 900 meters per week is appropriate.

  Recovery times for metabolic training have long been the subject of debate. For speed-work, however, *full recovery* is appropriate regardless of the period of season. The operative word here is *speed*. When speed-development is the goal, full recovery is required between bouts of running. Energy system training is an altogether different matter.

  While the opposite would seem true, the developing sprinter generally requires *less* recovery time between repetitions and sets since a young person's neurological system is more pliable than an adult. This is because novice athletes have not developed the ability to fully stress their nervous systems as more accomplished athletes have. Another consideration for adjustments in recovery time for the developing athlete is the short attention span typical of this group. Often the novice cannot maintain training focus through long recovery phases. In this instance, shorter recoveries may be wise when all is considered.

  Two-minutes recovery between *reps*, and **ten minutes** between sets, is a good starting point for developing athletes. At the elite level, as much as ten-minutes between reps and twenty-to-thirty-minutes between sets may be appropriate.

  Speed development sessions can be utilized two-to-three times per week. Gains in the performance of the neuromuscular system, however, are contingent on sufficient time being allotted for recuperation. Coaches should always allow 40 to 72 hours of recovery time between maximum speed-training sessions, depending on their duration and the training age of the athlete.

  Coaches can measure the readiness of the athlete's neuro-muscular system with a simple diagnostic test. Just as the endurance athlete tests readiness by monitoring heart-rate data, the sprinter can judge the status of the neurological system with the use of a *stopwatch*. This is done by the athlete starting the watch and immediately clicking-off as many splits as possible in ten-seconds and noting the range of split-times registered and their consistency. Typically, the athlete will produce split times of .16 to .20 when rested. If the neurological system is fatigued, the split-times increase and become more inconsistent.

If sufficient recovery of the athlete is in doubt, prior to a speed-training session this stop-watch test can offer valuable feedback. If the performer shows a marked increase in the split-times registered from previous trials, it may be wise to postpone the speed-work session until the next day.

Acceleration

Once the development of the maximum velocity capacity has begun, the next sprint-training focus should be improving acceleration. The objective of the acceleration phase is to reach maximum velocity as quickly and efficiently as possible. The acceleration phase, from a mechanical point of view, must be broken down into a "pure acceleration phase" and a "transition phase." Pure acceleration begins after the first two steps out of the blocks, and blends into the transition phase after the tenth or twelfth step. The duration of the transition phase is typically six to eight strides.

CHARACTERISTICS

The primary characteristics of the pure acceleration phase are the relationship between the hip and foot of the sprinter. Unlike sprinting at maximum velocity, accelerating requires the feet of the sprinter to hit the track *behind* the hips in the earliest strides. With each additional step, the sprinter assumes a more upright posture. The distance between the center of mass and base of support continues to lessen until the feet land directly under the hips.

During acceleration, the joint angles at the hip and knee are much sharper prior to ground contact when compared to maximum velocity. The direction of forces applied is more horizontal than vertical in this racing phase. Correct acceleration mechanics require maximum acceleration of the thigh over its full range of motion, meaning the knee comes up fully and quickly; however, rahter than the cyclical leg action of top-speed sprinting, the shins move with a "back and forth" piston-like action in acceleration, and heel recovery remains low.

The knee of the sprinter remains in front of the foot, both in the recovery and drive phases and the feet remain close to the ground. The corresponding angles of the shin and torso should be the same with respect to the ground. The ankle is always cocked in anticipation of ground contact being made with great force.

Acceleration and maximum velocity not only differ in the *direction* of the forces applied to the track but also in the *origin* of those forces produced. In acceleration, much of the force is generated from muscle contraction rather than elastic response. This is true in all events requiring acceleration.

Stride-length in the initial two steps of block-clearance and the ensuing eight to ten steps of pure acceleration increases at an amazingly regular rate. A range of increase of 10 to 15 centimeters is not uncommon. A slight decrease in stride-length is found near the end of the phase. This increment is directly related to the sprinter's leg-length and strength and power to body-weight ratios. Surprisingly, stride-frequency is extremely high for the elite sprinter during the acceleration phase. Here too, we see an incremental increase in the stride-rate of the athlete. *Only in acceleration do we see stride-rate and stride-frequency increase this way.*

IMPROVING ACCELERATION

Coaches can improve acceleration skills of their sprinters in three ways:

1. **Give task-specific cues.** Offering concise instructions to the athlete will help to actualize the precise body positions and mechanics sought in this racing phase.
2. **Increase the general and specific strength and power capacities of the athlete.** Many different means of training can be utilized to accomplish this objective.
3. **Re-program the neuro-muscular system.** The precise movements of acceleration-can be choreographed through specific training and regular rehearsal.

- **Task-Specific Cues**

  Significant study and preparation are required in all areas of a coach's responsibilities. Yet, the coaching capacity that may influence sprinters and their performance the most – coach/athlete communication – is usually the one allotted the least amount of thought or preparation. The way in which desired results are communicated to the athlete is perhaps the most important component in the coach – athlete relationship.

  The words coaches speak create **specific visual images.** It is these images that will prompt action by the athlete. Whatever mental picture the sprinter is provided, whether it is desirable or not, will be acted upon. Since the mind follows the direction of its current thought, the coach must be exact and precise with cues given to a sprinter.

In training and competition, the athlete should be reminded of the *specific motor responses needed.* This reminder is <u>not</u> new information. Instead, the cue will call up in the mind of the athlete the mental stimulus upon which he or she should act. Since each racing phase has its own inherently unique characteristics and demands, the instructions offered to the sprinter must reflect this diversity. **Each racing phase requires its own set of specialized cues.**

In contrast to the vague clichés common in coaching jargon, the cues given to sprinters must describe a specific action which paints a universally recognized picture. The frequently used cue for acceleration of "stay low" is an example of the misdirection many coaches inadvertently offer to athletes. This cue provides the sprinter with a distorted mental image of the body position required in acceleration. Bending at the torso as if ducking under a tree branch is a common but undesirable body position in sprinting. No doubt the "stay-low" cue has much to do with it. Instead, the sprinter should lift the chest up so a power line is created from the ankle of the support leg through the torso and head. In this way the body lines up at about 45-degrees with respect to the track.

More appropriate cues would include "stab back" or "push the track behind you." These descriptions relate to the direction of forces and foot placement required for acceleration. The following recommended drill sequences for acceleration also serve to emphasize the unique characteristics of this racing phase. The sprint coach is continually challenged to develop new cues to create the responses he or she seeks. A coach can signal the high frequency desired in acceleration with cues such as "hot ground," "quick feet," or even generic sounds that emulate the rhythm and tempo of the reoccurring foot strikes. Hand claps with an ever increasing rhythm, for instance, make that point.

When sprinters describe how their race is to be run, the words they choose can be very telling. If their account of the actions of the race is general and nondescript, coaches can expect this to be reflected in their lack of technical execution on the track. Athletes should be regularly questioned to determine the state of their technical understanding of their events.

If language seems to be failing either the coach or the athlete, pencil and paper can help. When uncertainty exists regarding the sprinter's imagery of racing techniques, ask the athlete to draw stick-figure examples of the desired movements and body positions throughout the various sprint-racing phases. This transfer of the athlete's mental image of technical performance characteristics to paper will give a coach a clear view into the mind's eye of that sprinter.

Another method to clarify an athlete's grasp of specific technical cues and concepts is to carefully observe how he or she assists younger, inexperienced sprinters. A person can only teach what that person knows, so when one athlete instructs another, his or her expertise is revealed. Observing the athlete as a teacher is an acid test of the athlete's technical awareness.

TRAINING FOR GENERAL AND SPECIFIC STRENGTH

The ability to accelerate will improve in direct proportion to gains in strength. Coaches can increase the general strength and power capacity of the sprinter with many different means of resistance training. All of these methods are intended to increase the amount of force the athlete can apply and the integrity of the pillar and the joint systems, and to limit the time spent on the ground.

Simple jogging is the place to begin. Even a slow jog requires the performer to move against the resistance of gravity. As a foundation of general conditioning is developed in an athlete with easy running, a coach can increase the demand on the athlete by changing the grade of the running surface.

Running up a hill or incline requires the athlete to lift the recovered leg through a greater range of motion than on a flat surface. The athlete must therefore exert a force against the ground sufficient to lift the center of mass somewhat higher than normal. The result is an increase in strength and power where the sprinter needs it most.

Multi-throws training is another excellent means to improve general and specific strength and power values. "Multi-throws" are exercises which combine movements through various ranges of motion followed by throwing an implement for distance using shot puts or medicine balls. One example of a multi-throw routine is the "between the legs forward throw." Holding the implement in both hands, the athlete bends forward and swings the implement back between the legs, then quickly changing directions, swings it up underhanded for as great a forward distance as possible.

In this type of exercise, the body mass of the athlete increases by the weight of the implement held. As that body moves, stressors to the muscular system increase. Finally, when the ball is launched, a great force must be applied into the ground. *The athlete also must extend into the same body position desired in acceleration.* This combination of increased loading, greater force application, and desirable body position are all obvious benefits for acceleration training.

Sprinting with a weighted vest or weighted pants is another proven method of enhancing strength and power. Once again, an increase to the load of the athlete's sprint systems is achieved by adding weight. By increasing the mass of the sprinter, it effectively expands the stimulus to the stretch shortening phenomena. The result is an improvement in general and specific strength and power accompanied by a reduction in time spent on the ground.

CHOREOGRAPHING THE MOVEMENTS OF ACCELERATION

As coaches work to improve the strength and power of their sprinters, they must simultaneously develop the specific skills of the acceleration phase. These skills are best introduced through the following drills and exercises. Each is designed to teach proper body-position and the desired direction of forces applied to the track. Repeated rehearsal of these routines will refine the motor pattern of the athlete to adapt to the unique demands of this racing phase.

A LEARNING PROGRESSION FOR DEVELOPING ACCELERATION SKILLS

- **Acceleration March Drill**
  Objective: To teach the desired body position and piston-like movement of the legs.

  Start with the athlete standing approximately one-and-one-half meters from a wall or other stationary object. With the feet fixed in place, have the athlete lean against the wall placing the hands flat against it. The body position achieved should now be approximately 45-degrees with respect to the ground.

  On the coach's command, the athlete begins to march by recovering one leg up with the ankle dorsiflexed and knee rising high to a point above waist level. Then the other leg is similarly recovered while the first is returned to exactly the same position on the floor. This march should continue for a 10-second interval. The pillar should remain in line with the support leg throughout the exercise. The movement of the legs is not cyclical as is the case in maximum speed running. Look for a back-and-forth leg action with the knees remaining in front of and above the ankle at all times.

While this exercise will test pillar strength, it is intended most to familiarize the athlete with the critically important body position unique to acceleration.

- **Wall Sprints:**
  Objectives: 1) To mimic the sprinting action found in acceleration without fighting the forces of gravity; 2) To improve stride frequency and refine the direction of forces applied to the track.

  Begin by assuming the same position as in the acceleration march drill. The athlete recovers one leg up into the ready position. This leg should be the same one that will be positioned in the front pedal of the starting blocks. This "ready" stance requires the ankle on the recovered leg is dorsiflexed, knee is up above waist height, and torso is in line with the support leg.

  The coach then announces in advance how many total steps are to be taken in succession. It is recommended to begin with sets of 3-steps. Holding his or her breath, the athlete sprints through three steps, exhales and holds his/her position. The instruction for the next set comes right away. Doing three continuous sets is standard. Once mastery is achieved, 5-steps then 7-steps, etc. can be utilized in each set.

- ***Continuous Wall Sprints:***
  Objective: To promote pillar strength, stride rate and energy system fitness while replicating the movements of acceleration.

  Here again, the athlete assumes the same ready position as previously described. On the coach's command, the athlete begins to sprint continuously. The focus is on achieving the highest possible frequency while moving the legs through a complete range of motion. The duration of exercise begins with five-second intervals. As competency increases, the time should be increased up to 10-seconds or more.

PARTNER DRILLS

- **Hip Hold:**
  Objective: To support the athlete so that desired body position and movements of acceleration can be rehearsed at sprint speeds.

  A spotter stands behind and places his or her hands on the hips of the sprinter who leans forward with a flat back and firm abs. The spotter steadies his or her body position. On the coach's command, the sprinter begins to pump his or her legs and arms in the desired piston-like motion sought in acceleration. The sprinter's body position is maintained due to the support of the spotter.

  After four to ten steps, the sprinter is released and continues to sprint through a designated distance of 30 meters. Regardless of the number of steps taken, when the spotter can no longer feel the weight of the sprinter, the spotter lets the sprinter go. If the spotter cannot feel the weight of the sprinter, the sprinter has lost the desired body position.

- **Face to Face:**
  Objectives: To increase forces applied to the track and identify when desired body position is compromised.

  In this exercise, the spotter faces the sprinter and supports the forward body-lean of the sprinter by placing his or her hands on the shoulders of the sprinter, accepting the sprinter's weight. On cue, the sprinter begins to sprint with proper acceleration mechanics. Arm action should be encouraged. Total distance is 30 meters. When the spotter can no longer feel the weight of the athlete, the spotter lets go and steps aside. The sprinter will likely revert back to old bad habits and allow the legs to become perpendicular at some point in the exercise.

- **Face and Chase:**
  Objectives: To develop transition skills.

  The sprinter begins as in the previous drill. After two to six seconds of action, the spotter turns away from the sprinter and sprints to the finish 30 meters away. The sprinter now becomes the pursuer. The goal is to catch the spotter before the finish line. The spotter of course will attempt to out-sprint the sprinter.

This exercise becomes a game while addressing several crucial training objectives. When the spotter turns and runs from the athlete, the resistance the sprinter worked against ends, as does the artificial support of his or her body position. Neurologically, the sprint systems respond to the contrasting demands of early resistance against the spotter and then the full final-sprint without the impedance. Add to the mix the competition factor between the partners, and the result is an effective training session for both sprinters.

- **Face, Chase and Race:**
  Objectives: To improve transition skills, pillar strength and energy system fitness.

  This final progression in partner drills adds another element to the Face & Chase routine. Again, designate a start and finish line 30 to 40 meters apart. Begin the exercise as before. The spotter supports the athlete with spotter's hands on the sprinter's shoulders. The sprinter drives out against the resistance aggressively. Two to six seconds after the exercise begins, the spotter turns away from the sprinter and attempts to run across the finish without being caught from behind.

  The new element to this exercise is when the spotter is tagged by the sprinter's hand, both athletes stop, turn 180-degrees and race back to the starting line. If the spotter is not caught before reaching the finish, they both turn around after the spotter reaches the finish line and sprint back to the start line.

  Many benefits can be derived from this drill. First, the competitive aspect of the drill improves its intensity of performance. Second, the sprint systems respond to the contrasting demands of resistance, braking, change of direction and re-acceleration. Finally, the drill shows that serious training can be achieved in a game-like setting and that hard work and fun can go together.

THE ACCELERATION LADDER™

Only in acceleration do we see stride-frequency and stride-length improve incrementally. We can improve the acceleration of an athlete by carefully choreographing the precise movements of this racing phase. The best means to address this neuro-physiological challenge is with a training concept called the ACCELERATION LADDER.

The ACCELERATION LADDER is a collection of ten rungs attached by cords that identify the approximate spacing of each foot-placement throughout the acceleration phase. Sprinting with this training tool will allow for an exact programming of the neuromuscular system. The rungs (or "sticks") used in this exercise improve the kinesthetic awareness of the athlete by allowing them to feel the proper foot placement as it occurs behind the athlete's center of mass.

This adjustable tool offers two different settings: The most common setting for a young or developing athlete is a 40:10 ratio. The second rung or stick is positioned forty centimeters from the first. Each additional rung is placed at a point that is ten additional centimeters away. The spacing progresses from 40cm to 50cm, then 60cm, 70cm and so on.

The second setting is appropriate for a taller or more advanced sprinter. This setting is a 50:15 ratio which follows the same pattern as before. The second rung is positioned 50cm from the first. The third rung then is 65cm from number two, the next rung is 80cm away, and so on.

The exercise begins with the use of five to six rungs. The sprinter places his or her power-side foot (the foot which is placed forward in the starting blocks) just in front of the first rung. The shin should be pointed toward the finish line, the torso in-line with the angle of the shin, the knee should line up in front of the spike plate, and the arms should hang loose from the shoulders.

It is important to note that at no time should the athlete step on the rung sticks. Rather the sprinter should drive back into the face of these rungs as a method of determining exact foot placement. This drill begins with a falling start. Before balance is lost, the smart-side leg (the leg placed back in the blocks) will quickly recover while simultaneously extending at the hip on the power side to move the center-of-mass forward. The emphasis on horizontal motion is critical.

After recovery of the smart-side leg is complete, the hips will be positioned past the second rung. The second step requires the recovered leg to be driven back down into the track surface as was rehearsed in each of the preceding drills. The athlete should be able to feel or sense the second stick or rung just behind the spike plate as ground contact is made. With each stride, the performer should drive the legs back into the running surface resulting in a horizontal displacement. As competency increases, additional rungs can be added to the exercise.

Repeated rehearsal of this drill will automate the precise movements desired in the acceleration phase of a sprint race. Even though the actual stride-length of the performer may not exactly match the pattern rehearsed, the benefits of the incrementally increasing steps will translate positively to competition.

The Start

WHO INVENTED THE STARTING BLOCK?

You might think the starting blocks used today were created by a scientist, or coach, or perhaps an athlete. Wrong! The first starting blocks were produced by a groundskeeper! In the days before the introduction of synthetic track surfaces, competition was contested on cinder or clay tracks. In order to produce the best start, athletes would dig two small holes in the track to accommodate the push-off necessary to overcome inertia. This technique worked well. It did however prove to be quite inconvenient for the man who was responsible for grooming the track surface. Imagine having to fill those holes after each race only to have the performers in the next round dig them up again.

The first starting blocks were not created to produce a better start. They were constructed to preserve the running surface. The starting blocks utilized today are not much different from the first models introduced decades ago. The science of optimizing the use of the blocks, however, has progressed tremendously.

WHERE TO BEGIN

Though the "start" begins a race, training for the sprints should not initially focus on this racing segment. Starting skills require a great amount of strength and power and neuro-muscular coordination. Once the athlete has begun to develop some of these capabilities, then work in and around starting blocks is appropriate.

Before starting skills can be taught, a coach must first determine the *power-side* and the *smart-side* of the athlete. As infants, our neurological development takes on a distinct pattern. One side of the body becomes the primary mover, while the other works in support. As a baby eats, one hand brings food to the lips while the other holds the plate steady. We write with the smart hand and hold the paper steady with the power-side hand. We kick with our smart-side leg, while the power leg supports all of the body weight.

Generally, the hand you write with and which foot you kick with represents the smart-side of the body. The smart-side foot is placed *behind* the athlete in the starting position. The power-side will generate most of the force from the front position.

THE LEARNING PROGRESSION

Starting skills should be introduced with the upright position first, and eventually evolving towards the crouched start. Repeated studies show that athletes who lack the strength, power, or technical skill needed for the crouched start will actually produce *slower* sprint times with starting blocks than without them! In competition, athletes should use only those starting skills that have been mastered. This may mandate that beginning or weaker athletes not use starting blocks initially.

CATEGORY ONE: FALLING STARTS

The common thread running through this category of drills is the body position assumed prior to the first movement. The athlete will allow gravity to pull him or her forward until the torso is at about 55-degrees with respect to the running surface. As this position is achieved, the athlete explosively begins to sprint and continues through a distance of at least 20 meters.

- **The Upright Falling Start**

  The power-side foot is positioned just behind the starting line wit the body weight on the sprinter's shoes spike plate, shin pointing forward so the knee is directly over the foot. The smart-side shoe grips the surface with the spike plate and is positioned behind the body. For balance, the arms are in sync with the legs with the right-hand/left-foot and left-hand/right-foot working in tandem.

  With pressure being applied through both the power-side and smart-side spike plates, the athlete should feel his or her hamstrings and gluteus muscles begin to fire as he or she allows the body to drift forward. Just before balance is lost, the athlete should apply maximum forces through both feet and explosively accelerate forward. The skills learned in acceleration training are implemented here. The breath is held for the first few strides of this starting action. The desired application of forces is largely horizontal so hip extension on the power-side is critical.

  Verbal Cues: "pressure on the spike plates," "push from the hip."

- **The Squat Falling Start**

  Assuming the same position as in the last drill with the feet set and arms synchronized, the hips lower into a squat position. The power-side leg (front leg) should be bent at the knee in a 90-degree angle, and the forward fall executed as before. As the desired body position is reached, the athlete should explode into an acceleration pattern. If athletes find it difficult to explode forward from this “squat” position, they are unprepared to execute a start from staring blocks in a crouched stance until additional gains in strength and power can be made.

Verbal Cues: “lower the hips,” “fully extend the power side.”

- **The 3-Point Start**
  Here, the ready position requires the power-side foot to be four to six inches from the starting line. In the squat stance, the smart-side or forward hand is lowered to the starting line. A bridge position is created by the hand with its thumb inside and four fingers held closely together outside. The other hand is placed on the power-side hip. The athlete begins to fall forward and quickly executes the start sequence with the smart-side hand thrown back, and the other hand moving up and forward. The power-side leg must push hard and the smart-side leg must press off the ground quickly.

  Verbal Cues: “push, press”, “elbow back.”

- **The 4-Point Start**
  Using the same ready-position as the previous drill, both hands should rest on the power-side knee, the shoulders dipped to knee-level. The hips remain high and the athlete should feel the stretch in his power-side hamstring.

  At the “set” command, both hands should drop to the starting line. The hands assume the bridge-position and the distance between the hands should be the same as the grip-distance in the bench-press exercise. As force is applied against the ground, through both feet, the shoulders and hands will counteract the forces applied by the legs, hips and gluteus. Holding his or her breath, the athlete explodes out with double-leg drive. The sensation is that of a tightly wound spring that is suddenly freed.

  Verbal Cues: “double leg drive,” “chest up.”

CATEGORY TWO: STANDING STARTS

Using a "standing start" position from the starting blocks was pioneered early in the twentieth century and this technique has been used randomly by the generations of sprinters that have followed. The latest resurgence of this method began in 1988. Charles Moye developed a starting block specifically designed for a standing start. It has been used extensively in training and competition on the high school level. Though the implement is legal on all levels of competition, it has rarely been used in elite level competition.

RATIONALE FOR USING THE STANDING START

The "standing start" technique allows most athletes to assume a set-position where the maximum amount of force can be applied in the least amount of time. Athletes who can move more weight in less time from a quarter-squat position than a half- or full-squat in the weight-room should use the standing start. Those who can lift twice their body weight from a half-squat are well-suited for the crouched start.
Standard starting blocks with adjustable pedals can be set to accommodate the standing start. However, stability and ease of use is an advantage of the Moye Block – which was designed only for this technique.

- **"Ready" Command Position**
  The front pedal of a standard set of staring blocks should be set four-to-six inches from the starting line. The front foot should load (curl) the toes elastically and be positioned so the shoe is in touch with both the track surface and the block pedal. The rear-foot shoe should be placed the same way on to the rear block-pedal. Both hands rest on the front knee – which should not be bent, but merely unlocked. The shoulders should be lowered to knee-level and the hips remain in a tall position.

- **"Set" Command Position**
  IAAF (International) rules require both hands to be in touch with the ground prior to the start for all races up to and including 400-meters. National High School Federation rules, however, have no such requirement; therefore, the high school sprinter can use a 3-point "set" stance. The benefits of the 3-point stance include one hand being free to hold a baton comfortably along with less flexibility being required to maintain that position. The 4-point stance allows more force to be applied prior to the start, which is required to reduce block-clearance time.

At the set command, in the 3-point start the smart-side hand is placed on the track surface, and the other hand on the hip. In the 4-point start, both hands are in touch with the track in a bridge position, bench-press grip distance apart. Force should be applied through both feet, keeping the hips high and holding that last breath until the fourth step in the acceleration pattern.

CATEGORY THREE: THE CROUCHED START

The pedals on the starting blocks should be positioned so the power-side pedal is in front, and the smart-side pedal is back. Each athlete should begin with the front pedal placed approximately two heel-to-toe foot lengths from the starting line, and the rear pedal positioned approximately one foot length from the front block. This simple guideline is usually quite accurate due to the relationship between an athlete's leg length and shoe size – a ratio which is remarkably consistent in all humans.

Facing the finish-line, the athlete should squat down and back into the blocks as if loading a spring. The spike-plates of both shoes should share contact both with the track surface and the block-pedals so the resulting "curling" of the toes creates an elastic response. The hands are once again placed in a bridge position, bench-press grip apart. *The head should neither arch back nor hang low,* but rather should remain in alignment with the back. Eyes should be focused straight at the starting line, and the area at the base of the neck and between the shoulder blades should be pressed upward.

- **Set Command**

  The athlete should inhale and hold his or her breath as pressure is applied equally to both block pedals. The athlete then lifts the hips up and locks into the set position by countering the force of the legs, hips and gluteus with the use of the shoulders, arms and hands. The hips should be raised in a methodical, controlled manner to avoid a loss of balance.

  It is natural for inexperienced sprinters to load up the leg in the front block and apply very little pressure to the rear leg. Coaches should make sure to correct this tendency early. If the muscles of the power leg are substantially pre-contracted in an isometric fashion, the resulting subsequent contraction at the gun will be slowed. Additionally, applying force to both blocks equally rather than simply stepping out with the back leg decreases block clearance time and provides for a more explosive start.

In order to mitigate this common mistake, coaches can instruct athletes to use primarily the muscles of their *rear* leg in order to elevate the hips into the set position. In this way, adequate pressure is applied to the rear block. As the completed set position is achieved, the strongest athletes will show a 90-degree angle at the knee on the power-side leg. Developing athletes should allow for a more open angle stance.

- **Block Clearance**
  At the gun, many actions must occur simultaneously. The sprinter should continue to hold his or her breath so maximum forces can be applied to press off of the back block pedal and quickly recover the smart-leg. The back heel should depress against the block explosively, and the back foot should then slingshot forward, staying low and close to the track. The power-side leg executes complete hip extension that thrusts the body forward. The angle of the power-side leg should is about 45-degrees when fully extended. Full hip-extension is critical.

  While the power-side foot is pushing off, the smart-side arm is thrown back, palm up and extended at the elbow. The opposite arm should come up and forward and rise as the chest rises upward. The power-side arm will take a position just above the head as if shading the eyes from the sun.

  When fully recovered, the smart-side foot is driven back into the track surface. It should land approximately five foot-lengths forward from the rear pedal of the blocks with the hips positioned directly above the foot. Extension of the smart-side hip then begins while the power-side leg is recovered. In the strides that follow, the skills learned in the Acceleration Ladder training will be implemented.

The Finish

Finish technique is a skill that should be taught, developed and practiced. Acquiring this skill can often make the difference between winning and losing a sprint race.

Here are two finish techniques that should be rehearsed often in training.

- **The Trip Finish**
  Within five meters of the finish line, the sprinter throws both arms back, with palms up. The arms should approach a parallel position to the track surface. The

head is turned to one side or the other so the ear is flat to the track. The top of the head points across the finish. This unique body position forces the torso forward projecting it across the finish line. The athlete must continue to drive through the finish line holding this position.

- **The Swim Finish**
  This technique requires the sprinter to mimic a swim-like side-stroke two strides from the finish. The forward arm is the arm which is furthest from the auto-timing camera. The head turns and looks in the direction of the camera. The other arm is thrown backward. This body position rotates the torso just enough to provide a bigger target for the finish photo. The Swim Finish is recommended for use when the competitors are expected to be closely bunched at the finish. This is most often true in indoor competition for the short sprint events.

Finish form should be rehearsed every time starts are practiced by setting a finish line at about twenty meters from the start. Rather than leisurely coasting to a stop after a trial repetition from the starting blocks, athletes should blast through the finish line using the technique prescribed by the coach. Hundreds of finish rehearsals can be practiced during the course of the training season this way.

Coaching the Relays

4 X 100 METER RELAY

The primary objective of the 400m relay is to move the baton around the track as fast as possible. Having great sprinters means nothing if the baton is not passed efficiently without a loss of speed. The goal is to maximize the speed of the baton – the speed of the runners only serves that purpose.

Team Selection

The six best sprinters on a team, regardless of event specialty, should be the group from which the four members of a 4 x 100m relay are chosen from meet to meet. "Coach-ability" and the willingness to practice baton exchanges are prerequisites for 4 x 100m relay runners.

Placement of Individuals

1st Leg. Coaches should look for a good, experienced starter and curve runner to run the first leg. Athletes of smaller stature with high turnover frequency usually have an advantage in combating the centrifugal force generated by running the curve. The fastest sprinter on the team might be considered for this position for two reasons: (1) developing a sizeable lead on the first leg puts considerable psychological pressure on opponents who must then play "catch-up," and (2) if the baton is passed well into the zone (as discussed later), this runner has the opportunity to run further with the baton at optimal speed than any other leg. This is also a preferable spot for a runner who does not receive the baton well.

2nd Leg. This leg is run almost entirely on the straight, and many accomplished teams place their fastest runner in the second position. A taller, lankier sprinter who might have trouble running a tight curve might be considered here. Coaches should look for a runner who both receives and passes the baton well. Since the baton is received and carried in the left hand on this leg, this position is a natural fit for a left-handed athlete.

3rd Leg. Ideally this should be both a team's best curve runner and its best baton handler. Mishandling the baton on the third leg spells defeat in the 400m relay.

4th Leg. Although the anchor leg has traditionally been reserved for the team's fastest sprinter, this may not always be the best choice. In fact, if the exchange is made beyond the midpoint of the zone as desired, this runner actually runs the shortest distance with the baton in his or her hand. This athlete should be your best *competitor*. He or she must handle the pressure of anchoring, have the competitive spirit to close a gap, and have a strong enough ego to deal with being caught and passed on occasion. Again, since this leg is run primarily on the straight, runners who are taller in stature would benefit from placement here.

Passing the Baton

There are several different methods of passing the baton for the 400m relay – the two primary among them are the **alternating upsweep pass** and the **alternating downward exchange.** Each of these techniques, both of which have been used effectively in international competition, will be outlined here.

The alternating downward exchange is the most common baton passing method; however, a slightly modified version of the alternating upsweep pass should be considered due to its proven advantages of speed, mechanics and consistency.

For the overhand pass to work well, the two sprinters must mesh at one exact moment.

This places a tremendous demand for accuracy on anxious and tired young runners who are moving at full speed with full physical effort. As coaches see time and again, dropped passes are common with this method. The record of USA relay teams in international competition over the years should be sufficient evidence. This country's successes have been more the result of having far better sprinters than the rest of the world rather than superior baton passing.

Although the downward exchange is the most commonly used passing method, we prefer a variation of the alternating upsweep pass. Certainly, the downward or overhand pass is used widely, apparently adds some **free distance,** seems quick in its execution, and possesses the pizzazz of verbal commands with its ubiquitous "stick." In fact, we believe it is an inferior method of passing.

- A quick downward slap, or flick, of the baton doesn't mean the exchange is keeping the baton moving fast. Once the incoming runner reaches out with the baton, he or she slows down because good sprint mechanics have been abandoned. The outgoing runner does the same with the added inhibition of leaning forward, thereby slowing acceleration. If the initial passing attempt is missed, both runners are forced to slow considerably in order to pass the baton within the exchange zone.

- Many runners like the overhand exchange because it is comfortable and closer to eye level. As with the sprint start, comfort doesn't indicate proper mechanics. Hitting an open, waving hand at full speed with a baton moving down and back is very difficult; moreover, the receiving hand is in poor position to easily grab the baton. A hand in this position is rigid, meaning the baton is likely to hit the wrist or butt of the palm rather than the soft crease of the thumb and index finger. In addition, an arm extended backward and held up to shoulder height tends to move around as the sprinter accelerates; furthermore, trying to hold the arm motionless inhibits sprinting.

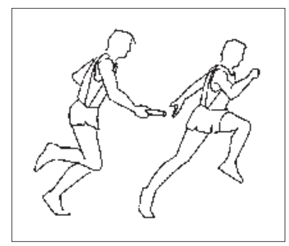
  Nonetheless, sprinters think the slap of the baton with its accompanying verbal commands is fast. This is usually the case until the baton tumbles onto the track with its familiar ringing sound.

- Many advocates of the overhand pass point to the "free distance" gained by passing at full arm extension; however, unless the pass occurs instantaneously at full speed, any gains in distance are more than offset by the negative mechanics of running with a fully extended arm. Although it might not be apparent to the eye, runners, and consequently, the speed of the baton, slow significantly upon the extension of the arm.

Furthermore, the *downward exchange* ***cannot be accomplished without some space between runners.*** The result of this is the incoming runner tends to back off as the exchange approaches, adjusting his or her speed so an adequate cushion of "free distance" can be *manufactured* in order to make a comfortable and safe pass. This deceleration results in the slowing of the linear velocity of the baton at the most critical juncture of the event.

The Alternating Upsweep Pass

From the facts presented above, it should be clear *the alternating upsweep pass is superior to the overhand pass.* The particular version presented here is actually called "the alternating, underhand, upsweep, straight-tube, twist pass" (see John Tansley's article, *Track Technique,* Winter 1991, #114). While the term is certainly a mouthful, its premise and execution are simple.



The Alternating Upsweep Pass

The upsweep pass has two overwhelming advantages. Its mechanics allow the baton to be passed with greater accuracy and *with less chance of the baton being dropped.* Because of this increased margin of safety, the baton can be passed at greater *speed* later in the exchange zone. These advantages meet the specific requirement of the event – to get the baton around the track as quickly as possible.

In comparison, the more fragile structure of the downward exchange requires the baton to be passed earlier in the zone at lower speed. The upsweep pass, done correctly, allows the baton to be passed safely in the last half of the zone when both runners are at high speed.

Here is an examination of the upsweep pass.

Alternating. As with the downward exchange, the baton is passed right hand to left hand to right hand to left hand. This allows the first and third legs to run close to the curve, eliminates switching the baton from one hand to the other, and helps avoid trouble if the sprinters run-up on each other. The baton always travels down the center of the lane.

Underhand. The underhand pass is achieved as the outgoing runner's arm comes back in a natural sprinting motion, with the elbow bent between 100- and 120-degrees and the wrist cocked upward. It is important to note the receiving arm is not fully straightened and the wrist is dorsiflexed so the palm is more or less parallel to the track surface. The hand is held open so a "V" is created at the juncture of the thumb and foefinger.

An underhand pass has several distinct benefits. First, an object put into a hand held palm down closes almost automatically. In fact, babies are born with a primitive reflex that closes the hand when something is pressed onto the crease of the palm. Second, the outgoing runner presents a more stable target with the hand held down. Third, and most important, an underhand pass enables both runners to run through the zone with strong sprint mechanics. This allows the incoming runner to maintain speed and the outgoing runner to accelerate fully.

Upsweep. This pass is initiated with an upsweep motion that occurs naturally with the foreswing of the runner's arm. Proper sprint mechanics are maintained, and the incoming runner does not lose speed by reaching far out with the arm. Even if the incoming runner "runs up the back" of the outgoing runner, the baton can still be passed at full speed; moreover, if the initial pass is missed, it does not break the passer's sprint rhythm. In the 1988 Olympic final, the Soviet relay team, using an upsweep pass, missed initial pass attempts yet still won because speed was maintained throughout the zone.

Straight-Tube. With an underhand pass, the baton does not turn end-over-end with each pass. Because of this, outgoing runners may grip the baton in the middle or at the lead end, leaving little of the baton extending for the subsequent exchange. This aspect of the underhand pass makes it necessary to incorporate the "twist" feature below.

Twist. One of the unique features of this passing method, albeit one that can also be used with an overhand method, is the twisting of the baton up in the hand after the pass. This allows the runner to receive any part of the baton without having to tap it against the body. Usually, it only takes two or three simple twists of the thumb and fingers to put the baton in the hand properly. Although some coaches will be dubious, the centrifugal force of the arm action actually makes this quite easy. Try it for yourself. This action can be rehearsed daily by relay runners during their warm-up routines. One helpful way to facilitate this "rehearsal" and, in fact, make all potential relay runners on the team comfortable with baton carriage and baton passing is to have several batons available every day in practice for runners to carry as they warm-up—old, chipped, dented batons that a team would no longer use in competition are perfect for this activity.

Some relay teams using the upsweep pass do try to pass hand-to-hand. That is quite acceptable, but it requires a very close and solid pass.

Patch Passing. Passing Zone Patch Areas. Patch passing is one of the most important features of successful relay baton passing, and it can be incorporated into any baton passing method.

It encompasses the concept of using a "patch area" rather than a single "takeoff mark" to indicate when the incoming runner is close enough for the outgoing runner to begin sprinting.

The "patch area" is created by the outgoing runner who marks or places tape on the track to create a "patch" that forms a rectangle in the team's lane of 1.5 meters or 4–5 feet in length rather than a single piece of tape to be used as a takeoff mark.

With the traditional single piece of tape used for a "takeoff" mark, the outgoing runner is forced to judge when the incoming runner reaches that specific takeoff point. Rarely does the incoming runner actually land on that piece of tape, thus demanding some very rapid judgment or proprioception on the part of the outgoing runner. Given that the outgoing runner is almost always anxious, bent over, looking backward, and a teenager, that can be a pretty hefty demand.

Patch passing makes the "go" or "takeoff" point consistent and easy to see. By creating a patch, the outgoing runner needs only to watch for the foot of the incoming runner to touch the ground within the patch. On those rare occasions when the incoming runner steps just before the patch and then the second foot lands on the other side of the patch, the outgoing runner still knows to start when the incoming runner is in the "patch area."

Patch passing allows the outgoing runner to start with full acceleration at the same moment in every race. Minimizing anticipation and judgment creates a safe and consistent pass with good acceleration. Of course, full speed practice is required to determine the correct patch placement on the track.

With the strong predictability of patch passing, verbal signals can even be eliminated. Passing by verbal signals is often subjective and inconsistent. In large, close races, it is very easy for these signals to be lost amidst the noise and confusion eight or nine runners all yelling at one time. With good patch passing, a predetermined patch or mark can also be made within the exchange zone. That way, the outgoing runner only needs to respond to his or her own acceleration. Once the runner hits the patch, back goes the hand. If the baton does not arrive immediately, the outgoing runner knows to slow somewhat until the baton is there.

The Alternating Downward Exchange

With this method, the incoming runner grips the bottom portion of the baton and passes it with a downward sweep to the outgoing runner who extends his or her arm back, palm up. As with the upsweep method, it is passed right-to-left at the first exchange, left-to-right at the second exchange, and right-to-left at the third exchange.

The baton always travels down the center of the lane, so the first leg runner stays in the inside half of the lane (important since the majority of the first leg is run on the curve), the second leg runs in the outside half of the lane (not important since the majority of the second leg is run on the straight), and the third leg runs on the inside of the lane (important since the majority of the third leg is run on the curve). This arrangement not only allows the first and third legs to run the shortest distance around the curve but, most importantly, it permits relay members to run-up to each other without getting their legs tangled. Remember, it is the speed of the baton moving through zone that is paramount—not the speed of the runners. If the two runners are almost side-by-side, it is fine if the speed of the baton is not slowed.

The Exchange Zone

The baton must be passed within a 20-meter exchange zone marked on the track by lines which cross the width of each lane. It is the successful exchange of the baton that determines if it has been passed legally. If the outgoing runner has stepped over the far end of the exchange zone, but the baton is still within the exchange zone when it has completely passed from the incoming runner to the outgoing runner, the exchange is legal.

In relay races shorter than 400 meters, the exchange zone is preceded by a 10-meter "Acceleration Zone" marked on the track by a small triangle in the middle of the lane. The outgoing runner may begin his or her run-up into the exchange zone from anywhere inside that acceleration zone; however, in order to ensure that maximum acceleration of the outgoing runner has been achieved at the point of exchange, it is recommended the entire 10m acceleration zone be used.

The Outgoing Runner

The outgoing runner may either stand or crouch at the beginning of the acceleration zone, with both knees bent for good leg angles and both feet pointing in the direction to be run. Body lean should be forward with weight equally distributed over both legs. Both heels should be off the ground with the head turned looking back.

Adjustments as to the exact placement on the track of the "go patch" have to be made during training sessions as the two runners practice the exchange.

Of course, there are other factors that affect the speed of the incoming runner and the acceleration of the outgoing runner in every meet such as the wind or the condition of the running surface.

Responsibilities of the Outgoing Runner:

- Know exactly which lane your team has been assigned before you go to your zone.
- Remove all other "go" marks from your lane.
- Place your "go" patch all the way across your lane.
- When the incoming runner hits the patch, start explosively and accelerate all the way through the exchange zone. Never slow or float to receive the baton.
- Stay on your half of the lane!
- Do not extend your hand back for the baton until the incoming runner calls for it or you reach your mark.
- Give the incoming runner a steady, **soft hand** (slightly cupped) when he or she calls for it. Don't grab for the baton. Never look back.
- Following the race, discuss the execution of the passes with your incoming and outgoing partners to determine how you might be able to improve.

The Incoming Runner

It is the duty of the incoming runner to get the baton into the hand of the outgoing runner.

Responsibilities of the Incoming Runner:

- Catch the outgoing runner!
- Stay on your half of the lane.

- Do not extend the baton until you have focused on the hand. Do not decelerate, and never lean to reach the hand.
- Shove the baton up into the crease of the palm hand.
- If you miss completing the pass on the first stroke, keep sprinting, and get the baton into the hand on the next stroke.
- Sprint all the way through the zone, regardless of where you complete the exchange!
- Stay in your lane until the outgoing runner in every other lane has passed you.
- Following the race, discuss the execution of the passes with your incoming and outgoing partners to determine how you might be able to improve.

RELAY PRACTICE TIPS

- **Practice baton exchanges at realistic racing speeds.** The most common mistake many high school teams make when practicing baton exchanges is to conduct a training session with the incoming runner sprinting full speed from a distance of 30 meters or less—this certainly does not simulate race conditions in which the incoming runner is required to make the baton exchange after a full effort of 100 meters when the runner is decelerating and very tired. Practicing baton exchanges at speeds that cannot possibly be achieved during the actual relay will only serve to ensure the exchanges will not be efficient.

  Another mistake high school teams make is to practice relay exchanges at the end of practice when all relay members may be tired. Productive relay training should be done when all relay members are fresh and sufficiently warmed up to produce a full effort. Just as practicing baton exchanges at speeds greater than can possibly be achieved is undesirable, practicing exchanges at speeds slower than race speed due to athletes being tired or improperly warmed up will also yield poor results.

- **Emphasize maintaining the speed of the baton through the zone.** (If the two runners were invisible, you should never see the baton slow down.)
- **Practice exchanges in different lanes, including Lanes 1 and 8!**
- **Practice with other sets of runners in adjoining lanes** to simulate the congestion and distractions runners have to deal with in the zone. One excellent way to do this that will allow a single coach to see more exchanges is to have your one and two

runners work in lane three and your three and four runners work in lane 5 or have your varsity boys work in lane three, your junior varsity boys in lane four, your sophomore boys in lane five, and your girls varsity in lane 6. To further simulate congestion, start each group at slightly different times.

- **Coaches should watch exchanges from a distance** —many coaches find it helpful to watch exchanges from the stands to get a better perspective. It is difficult to determine if a runner leaves early or if the pass occurs at the proper point if the coach is right next to the action.

4 X 400 METER RELAY

The 4 x 400m relay is the final running event in a track meet, so the result of that event could very well determine the outcome of the entire meet. However, even if a team has lost the overall meet a strong effort in the 4 x 400m can lift an entire team's spirt.

As with the 4 x 100m relay, a team that passes the baton well can gain on every exchange over a team that does not.

Team Selection

Your six best 400m runners, whether they are 100/200m specialists, hurdlers, 800m runners or milers, should be the group from which you choose the four members of your 4 x 400m relay from meet to meet.

Placement of Individuals

1st Leg. Usually, this is where a team traditionally would put the second best 400m runner to attempt to give the team the early lead or, at least, put the team at the front of the pack. This leg is run completely in lanes and out of blocks at the start, so it is not a spot for an 800m runner or miler.

2nd Leg. In multi-team meets, which use a three-turn stagger for the 4 x 400m relay, it is crucial to have a second leg runner who will run aggressively for the first 100 meters to position the team well after the break—this runner must not be timid or afraid of a bit of contact. This is a good spot for 800-meter runners due to their experience in breaking to lane 1 on the backstretch.

3rd Leg. This is where most teams place their slowest runner; however, if the third best runner is good at hanging onto the leaders or closing gaps, it may be wise to place the slowest leg second.

4th Leg. This should be the team's best 400m sprinter if that runner can handle the pressure of anchoring and has both the competitive spirit to chase and a strong enough ego to deal with being caught and passed on occasion.

Passing the Baton

The objective is to pass the baton from one runner to the next with no loss of speed. As with the 4 x 100m relay, there are several different methods that may be used for passing the baton in the 4 x 400m relay.

The Semi-Visual, Non-Verbal Exchange

With this method, the lead-off runner begins with the baton in the right hand. All passes are made from the incoming runner's right hand to the left hand of the outgoing runner, which means runners must quickly change the baton from the left to right hand shortly after receiving it. The reason for the second, third and fourth runners receiving the baton in their left hands is it allows them to face the inside of the track. This enables the outgoing runners to quickly assess their inside lanes and avoid the confusion that often occurs after the first exchange, when the relay is no longer run in open lanes.

Outgoing runners must judge the incoming runner's position and finishing strength (read fatigue), just as they would judge the speed and trajectory of a fly ball when playing center field. When the outgoing runners judge it is time to go, they turn to face down the track, accelerate quickly for three strides, and then reach back thumb-up to take the baton in their left hands.

Because of the fatigue and blurred vision often experienced by incoming runners, their only responsibility is to run through the zone and extend the baton once they get close enough to make the pass to the outgoing runner. It is the outgoing runner's responsibility to *take the baton* from the hand of the incoming runner!

The Exchange Zone

The baton must be passed within a 20-meter exchange zone marked on the track by lines that cross all lanes of the track. Unlike the 4 x 100m relay, there is no acceleration zone in the 4 x 400m relay, and the outgoing runners must stand within the 20m zone to await the incoming runner. The baton must be received within the exchange zone to be a legal pass.

Responsibilities of the Incoming Runner:

- Drive all the way to the finish line and through the exchange zone. Do not decelerate as the baton is extended to the outgoing runner.
- Do not extend the baton until you are close enough to make the pass to the outgoing runner.
- Do not try to place the baton in the hand of the outgoing runner. Make the baton a steady target and let the outgoing runner take it from you.

Responsibilities of the Outgoing Runner:

- Take the baton in full sprinting stride from the incoming runner, not standing still.
- Begin accelerating from the back of the zone looking straight ahead. After three strides, look back and take the baton from the incoming runner with your left hand, thumb-up.
- For the athletes running legs two and three, when safe, change the baton from the left hand to the right hand.

Applying Strategy to the Sprint Races

100 METERS

The three phases of the 100 meters are the start, acceleration phase and the stride/ lift phase.

1. The Start *(first stride out of the blocks):*

- Train for a rapid, consistent reaction to the gun.
- The athlete should move immediately, in a controlled fashion, into the "set" position so he or she is not left in the blocks by a quick gun.
- Get into a good "set" position, with pressure on both blocks—the athlete must trust his or her ability to react.
- *Do not* concentrate on the gun! Concentrate on what to *do* at the gun! Drive the arm opposite of the back leg off the starting line to begin the action of falling forward, which in turn triggers the reflex of the legs exploding off the block pedals.

- Think *beyond* the first stride! Visualize exploding out of the blocks and accelerating down the track.

2. The Acceleration Phase *(first 50–60 meters):*

- Maintain relaxation by concentrating on being *quick and light,* not on digging holes in the track.
- Don't chase; a sprinter should run his or her own race! Don't focus on the opponents and forget to run your own race.

3. The Stride/Lift Phase *(final 40–50 meters):*

- Maintain speed by maintaining mechanics and relaxation. Never struggle!
- Don't run to finish; run *through* the finish line!
- Practice leaning so it occurs *at* the finish line, not before or after the line.

200 METERS

The four phases of the 200 meters are the start, acceleration phase, transition phase and the stride/lift phase:

1. The Start *(first strides out of the blocks):*

- Angle the starting blocks tangent to the top of the curve.
- All other considerations for the 100m start apply.

2. The Acceleration Phase *(first 50–70 meters):*

- In the 200m the entire acceleration phase occurs on the curve, so practice accelerating on the curve from the blocks in every lane.
- Don't concede the race if lane one is drawn! It is the longest and tightest curve to run, so prepare or the challenge by training in Lane 1 often.

3. The Transition Phase *(from the curve into the straight, 80–100m into the race depending on the lane):*

- Lean into the curve to create a **slingshot effect** upon entering the straight.
- Practice making the transition from the curve into the straight in the inside three lanes (the tightest curves). The more a sprinter has to lean into the curve, the more difficult the transition into the straight will be.

4. The Stride/Lift Phase *(final 130–150 meters):*

- Maintain speed by maintaining mechanics and relax. Never struggle!
- Don't run to finish; run *through* the finish! Practice leaning so it occurs *at* the finish line, not before or after the line.

400 METERS

The 400 meters is a specialized speed-endurance event. ***These are the "racing weapons" a runner must have to be a successful 400m sprinter:***

1. The ability to judge pace. Recommended pacing for high school 400m runners, for the first 200 meters of the race:

- **F-S Girls** . . . . . . best 200 + 4.0 sec.
- **Varsity Girls** . . . best 200m + 3.0 sec.
- **F-S Boys** . . . . . . best 200m + 2.0–2.5 sec.
- **Varsity Boys** . . . best 200m + 1.5–2.0 sec.

2. The ability to adjust pace.

3. The ability to *maintain rhythm.*

4. The ability to *maintain sprint mechanics* in fatigue.

OTHER TACTICAL ADVICE FOR SPRINTERS

- In meets where preliminary rounds are run, start fast and work no harder over the final stages of the race than is necessary to advance to the next round or final. The objective for a team should be to advance to the final *without* its opponents knowing exactly how fast it is capable of running.
- Warm-down immediately after the race to *flush* the acid buildup out of the muscles.
- If there is another round or event to be run, runners should put on their sweats immediately to avoid cooling off too quickly. Warm-up thoroughly for the next race.

A Training Periodization Plan for the Traditional High School Track Season

The high school track and field season can be divided into the following four periods:

- **Preseason** . . . . January to Mid-February . . . . (6 weeks)
- **Early Season** . . . . Mid-February through March. . . . . (6 weeks)
- **Mid-Season** . . . . . April . . . . (4 weeks)
- **Late Season** . . . . . May . . . . (4 weeks)

Each period should have specific objectives and employ different training methods. Research has shown that four to six weeks appears to be the maximum sustained period of improvement for any single type of training; therefore, a system of training sprinters should follow a seasonal training plan that uses a variety of training methods.

FINAL THOUGHTS

A coach should recognize sprinters cannot train at high intensity and compete in 13–18 meets over the course of 20 weeks without the likelihood of becoming injured. Sufficient recovery after each hard training session and track meet is crucial for a sprinter to develop and attain his or her training objectives and performance goals. A complete warm-up and warm-down each day plays a key role in enhancing restoration. Other restoration enhancement methods, such as massage, sauna, electrostimulation and Jacuzzi can be helpful, but they cannot replace the body's need for recovery time between bouts of hard training.

PLANNING AIDS FOR DEVELOPING YOUR TRAINING SYSTEM

SPRINTERS WORKOUT

Sequence Group: Date:

RUNNING WARM-UP:

Pre-stretch plus:

FLEXIBILITY/MOBILITY EXERCISES:

❑ Static Series ❑ Swing Series

BUILD-UPS:

x60m x80m x100m x120m x150m

BLOCK STARTS:

WORKOUT:

❑ Sprint-Float-Sprint	❑ 400m Speed Play	❑ Degressing Reps
❑ Lean Drills	❑ Uphill Sprints	❑ Pyramid Reps
❑ Interval Sprints	❑ Downhill Sprints	
❑ Repetition Sprints	❑ Curve Sprints	

BATON EXCHANGES:

WARM-DOWN:

RHYTHMIC PLYOMETRIC DRILLS X Reps or Meters

POWER PLYOMETRIC DRILLS X Reps or Meters

WEIGHT TRAINING:

SAMPLE 100 M SPRINTERS WORKOUT

Sequence — Group: 100m Group — Date: Mon April 9

1 **RUNNING WARM-UP:**
Pre-stretch plus: 1600m Surge straights last two laps

2 **FLEXIBILITY/MOBILITY EXERCISES:**
☑ Static Series ✓❑ Swing Series Plus Rhythm Drills

3 **BUILD-UPS:**
3 x60m 2x80m 1x100m x120m x150m

4 **BLOCK STARTS:** 5

5 **WORKOUT:**

- ❑ Sprint-Float-Sprint
- ❑ Lean Drills
- ❑ Interval Sprints
- ❑ Repetition Sprints
- ☑ 400m Speed Play
- ❑ Uphill Sprints
- ❑ Downhill Sprints
- ❑ Curve Sprints
- ❑ Degressing Reps
- ❑ Pyramid Reps

4 x (100m jog-stride-100 jog-100 sprint)
Walk 200 between each set
Fred- Ben -Walter
Desiree - Pamela - Michelle

BATON EXCHANGES:

6 **WARM-DOWN:** 800m

RHYTHMIC PLYOMETRIC DRILLS X Reps or Meters

POWER PLYOMETRIC DRILLS X Reps or Meters

7 **WEIGHT TRAINING:** 1 x upper body set

SAMPLE 200 M SPRINTERS WORKOUT

Sequence Group: 200m Group Date: Mon April 9

1 **RUNNING WARM-UP:**

Pre-stretch plus: 1600m Surge straights last two laps

2 **FLEXIBILITY/MOBILITY EXERCISES:**

☑ Static Series ☑ Swing Series

3 **BUILD-UPS:**

x60m x80m x100m x120m 4 x150m

BLOCK STARTS:

4 **WORKOUT:**

- ❑ Sprint-Float-Sprint
- ❑ Lean Drills
- ☑ Interval Sprints
- ❑ Repetition Sprints
- ❑ 400m Speed Play
- ❑ Uphill Sprints
- ❑ Downhill Sprints
- ❑ Curve Sprints
- ❑ Degressing Reps
- ❑ Pyramid Reps

2 x (300m - 60 sec. - 300m) 8 min. between sets

Will - Dustin - Leo @ 45 - 45

Sjoni - Lana - Carlyn @ 50 - 50

5 **BATON EXCHANGES:** 4 x 400 R 3 x ea. exchange

6 **WARM-DOWN:** 800m

RHYTHMIC PLYOMETRIC DRILLS X Reps or Meters

POWER PLYOMETRIC DRILLS X Reps or Meters

7 **WEIGHT TRAINING:** 1 x upper body set

SAMPLE 400 M SPRINTERS WORKOUT

Sequence | Group: 400m Group | Date: Mon April 9

1 **RUNNING WARM-UP:**

Pre-stretch plus: 1600m Surge straights last two laps

2 **FLEXIBILITY/MOBILITY EXERCISES:**

☑ Static Series ☑ Swing Series

3 **BUILD-UPS:**

x60m x80m 6 x100m x120m x150m

BLOCK STARTS:

4 **WORKOUT:**

- ❑ Sprint-Float-Sprint
- ❑ Lean Drills
- ❑ Interval Sprints
- ❑ Repetition Sprints
- ❑ 400m Speed Play
- ❑ Uphill Sprints
- ❑ Downhill Sprints
- ❑ Curve Sprints
- ☑ Degressing Reps
- ❑ Pyramid Reps

3 x (200 - 150 - 100 / jog 100 same distance) Recovery

Jay - Wade - Chris @ 27 - 19.5 - 13

Shelly - Gniesha - Angel @ 33 - 24 - 15

5 **BATON EXCHANGES:** 4 x 400 R 3 x ea. exchange

6 **WARM-DOWN:** 800m

RHYTHMIC PLYOMETRIC DRILLS X Reps or Meters

POWER PLYOMETRIC DRILLS X Reps or Meters

7 **WEIGHT TRAINING:** 1 x upper body set

2-4 WK PHASE	PRIMARY EMPHASIS	SECONDARY EMPHASIS
Preseason	**1 Aerobic running** **2 Circuit training**	**Circuit training** **Aerobic running**
Early season	**3 Repetition training** **4 Repetition training**	**Speed drills** **Speed drills**
Mid-season	**5 High-lactate training** **6 Speed-endurance**	**Speed endurance** **High-lactate training**
Late season	**7 Peak-speed training**	**High-lactate training**

SAMPLE 4-WEEK 400M TRAINING PLAN, APRIL 1–28

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1 **DEGR Reps** 3 x (200-150-100) Jog Same dist for recovery 8 min between sets **Weights**	**2** **S-F-S** 3 x (100 Sprint-100 Float-100 Sprint) Walk 400m between	**3** **Warm-Up** **Team Meeting** Stretch 5x100 Strides 4x400R Exchanges	**4** **Meet** **Home Meet** **vs** **Crispis**	**5** **Warm-Up** Warm-up Stretch 4 x 150 Strides	**6** **Meet** **Arcadia** **Invitational**	**7** Easy Run or Rest Day
8 **Speed-Endurance** **3 x 500M** 8 min recovery **Weights** **1 x 300m-200-100**	**9** **Pyramid Reps** 4 x (100-200-100) Increase speed, decrease recovery each set	**10** **Warm-Up** **Team Meeting** Stretch Strides 300-200-100 4 x 400R Exchanges	**11** **Meet** **Away Meet** **vs** **Du Bois**	**12** **Easy Run (20 min)** Stretch Rhythm Drills **Weights**	**13** **O'Brien** **Invitational**	**14** Easy Run or Rest Day
15 **Speed Reps** 8 x 60m Walk/Fly Start Walk/Jog 300 between Reps **Weights**	**16** **S-F-S** 3 x (100 Sprint-200 Float- 100 Sprint) Jog 400	**17** **Warm-Up** **Team Meeting** Stretch 5 x 100 Strides Medley Exchanges	**18** **Meet** **Home Meet** **vs** **Mc Kinley**	**19** **Warm-Up** Warm-Up Stretch 3 x 250 Strides	**20** **Meet** **Mt. Sac** **Relays**	**21** Easy Run or Rest Day
22 **Speed-Endurance** 1 x (600-500-300) 10 min recovery **Weights**	**23** **Easy Run** 30min Easy Run Stretch Stride 300-200-100	**24** **Speed Reps** **8 x 150m** Walk/Fly Start Walk 150/Jog 100 Recovery	**25** **Technique Training** 10x Block Starts around Curve 4 x 400R Exchanges **Weights**	**26** **Interval Sprints** 3 x (300-60 sec-300) 8 min between sets	**27** **Rest Day!**	**28** Easy Run or Rest Day

CHAPTER 11

Training Hurdlers

The hurdle events are rhythmic events. Speed is a basic requirement for hurdling, but the ability to express speed within a rhythmic pattern is more important. Hurdle events are not jumping events. Racing over hurdles demands an elongated sprint stride with as little deviation from correct sprint form as possible. Technique, mobility, poise, muscular strength and stamina are qualities needed for the hurdle events. The hurdles are a test of athletic versatility.

A Philosophy for Coaching the Hurdles

The hurdler's most important physical asset is speed. The key to success is maintaining speed between hurdles. This is where rhythm becomes a key ingredient.

Nine factors can be identified as contributing to successful hurdling: speed, rhythm, technique, flexibility (which includes range-of-motion), strength, stamina (to maintain proper technique), poise and body type (especially leg length).

Of these nine factors, all but the hurdler's body type can be greatly enhanced by proper training.

HURDLE REFERENCE CHART

	Girls' 100m H	Boys' 110m H	Girls' 300m H	Boys' 300m H
Hurdle Height	33 inches	39 inches	30 inches	36 inches
Number of Hurdles	10	10	8	8
Distance to First Hurdle	13 meters	15 yards	45 meters	45 meters
Distance Between Hurdles	8.5 meters	10 yards	35 meters	35 meters
Distance from Last Hurdle to Finish	10.5 meters	14.02 meters	10 meters	10 meters
Strides to First Hurdle	8–9	8–9	22–24	21–23
Strides Between Hurdles	3	3	15–18	14–17
Strides from Last Hurdle to Finish	5	6	5	5
Total Strides	50–51	51–52	140–205	140–195
Flat Time vs. Hurdle Time	Add 2.0–2.5 sec.	Add 2.0–2.5 sec.	Add 2.5–4.0 sec.	Add 2.0–3.5 sec.
Takeoff Distance to H	5'3"–6'4"	6'6"–7'6"	5'–6'	6'6"–7'6"

Teaching the Technique of Hurdling

FUNDAMENTAL MECHANICS

- Hurdling is sprinting over the hurdle, rather than jumping over it. The center of gravity is actually raised very little to clear the hurdle.
- Hurdle clearance is accomplished by transferring speed (horizontal momentum) vertically at takeoff.
- A short last stride helps the body accelerate into the takeoff.
- Forward lean at takeoff transfers vertical momentum into a flat, parabolic flight of the body over the hurdle.
- At takeoff, the lead leg creates a short moment-of-inertia by leading with the knee to the hurdle.
- The eyes should look up during takeoff and focus on the next hurdle.
- The lead arm and trail leg should act as short, quick levers over the hurdle to accomplish a rapid clearance. Improper arm-action creates compensating actions, which result in off-balance landings.
- Forward lean must be maintained over the hurdle until touch-down to maintain forward velocity. This allows the athlete to return to the ground in sprint position.
- Sprint speed can be improved by increasing either stride length or stride rate. Hurdling speed can only be improved by increasing the efficiency of hurdle clearance and the stride rate between hurdles.

HURDLE TECHNIQUE CHECKLIST

Head and Chest

- Chest over lead thigh in advance of the lead leg knee.
- Head no higher than normal sprinting position.
- Eyes focused on the next hurdle at takeoff.
- Shoulders level and parallel to the hurdle.
- Hold forward lean until lead foot touches down.

Lead Leg

- Drive the knee, rather than kick the foot, to the hurdle.
- Lead toe pulled back, not pointed.

- Reach a bent lead leg over the hurdle.
- Begin snap-down when the lead foot, not the hip, reaches the hurdle.
- Drive the lead leg straight at and over the cross piece. Don't "hook" the hurdle.
- Straighten the lead leg during snap-down.
- Land on the ball of the foot.
- Drive off the ball of the foot into the getaway stride.
- Do not drop onto the heel.

Trail Leg

- Pull the knee through under the armpit, not flat across the top of the hurdle. The heel passes close to the hip. Keep the foot dorsiflexed with the toes pointed *up*.
- *Pull* the knee over the hurdle and *push* the foot down.

Lead Arm

- At eye level during takeoff.
- Upper arm parallel to the thigh of the lead leg.
- Lead arm bent 120-degrees during reach and pullback.
- Lead hand sweeps back *below* the trailing knee.

Between Hurdles

- Vigorous drive off the hurdle into a long "getaway" stride.
- Good high-knee sprint action on the balls of the feet.
- Active **cut-step** into takeoff at the next hurdle.
- Full extension off the ball of the foot into takeoff.

Stages of Hurdling: Girls' 100m and Boys' 110m

The Start

The lead leg should be positioned in the back block if an even number of strides are taken to the first hurdle (preferably eight strides), and the trail leg should be in the back block if an odd number of strides are used. In the "set" position, the hips should be slightly higher than the shoulders with the arms supporting the shoulders directly above the starting line. The hurdler's "set" position should be comfortable without too much weight over the hands.

The First Strides

The hurdler must move to a *tall* sprinting position by the time he or she is two strides away from the first hurdle. The center of mass should be high going into the takeoff.

The hurdler should drive off the front block with a full extension of the leg for a *long,* quick first stride. Each successive stride to the hurdle should lengthen until the cut-step into the takeoff (see Fig. 11-1).

The Takeoff

The takeoff at each hurdle is crucial because it must be part of a continuous acceleration through the initial stages of the race. Hitting a hurdle or landing off-balance will result in a loss of speed, which can never be recaptured in a race of 100 to 110 meters.

Taking off too close to the hurdle forces a vertical takeoff to clear the hurdle, resulting in a higher, slower parabolic flight over the hurdle. The taller the athlete, the further he or she must take off from the hurdle for a flat, fast clearance.

For female 100m hurdlers, the race is run over barriers 33 inches high. The takeoff distance to the hurdle should be approximately six feet. For male 110m hurdlers, the

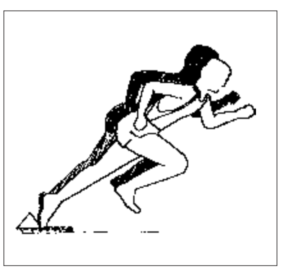


Fig. 11-1. Sprint Start for sprinter vs. hurdler (shadow figure).

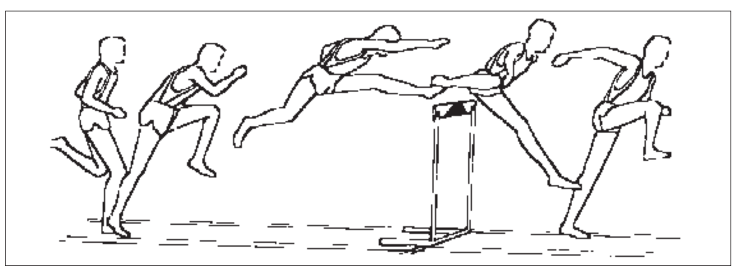


Fig. 11-2. Boys' 110m Hurdle Clearance.

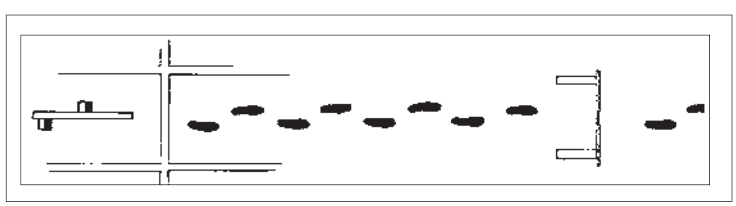


Fig. 11-3. Strides to the 1st Hurdle (Boys' 110m/Girls' 100m).

race is a sprint over 39-inch barriers. The takeoff distance to the hurdle should be about 6½–7½ feet, depending on the athlete's height, leg length, stride length and forward velocity. Figures 11-2 and 11-3 illustrate the takeoff and action over the hurdle.

The lead leg action is initiated by driving the knee towards the top of the hurdle. The lift of the lead knee should be explosive, aiding the powerful extension off the takeoff leg. The lower leg is relaxed and tucked under the thigh as the lead leg drives upward. The foot should be dorsiflexed with the top of the foot pulled up toward toward the shin. This tucking action gives the hurdler a short, quick, bent lead leg, and helps shift the center of mass forward over the hurdle. The lead arm should reach slightly across the body to keep the shoulders square to the hurdle.

Lead Leg Action Over the Hurdle

The peak of the hurdler's parabolic flight should be achieved prior to reaching the hurdle. The lead leg should remain slightly bent over the hurdle. Once over the hurdle, the objective is to get back down to the track as quickly as possible. This is accomplished by a **snap-down** action of the lead leg. Snap-down should begin as soon as the lead foot, not the hip, has passed over the hurdle. The lead leg should be nearly straight by the time the foot touches down below the hips on the other side of the hurdle.

Trail Leg Action Over the Hurdle

Once the takeoff leg leaves the track, it becomes part of the trail leg. The heel of the trail leg should come to the buttocks with the toe pointed out to the side so the foot will avoid hitting the hurdle. For a short, quick lever over the hurdle, trail leg position should be high *and tight,* with the knee under the armpit and the heel close to the hip. Avoid a "flat" position with the hip, heel and foot all on the same horizontal plane. The action of the trail leg should be a continuous movement during the hurdle clearance, without a pause, or **float,** over the hurdle. As the trail leg pulls through, the lead arm will swing to the side in wide arc as a response to the trail leg action. The shoulders remain square to the hurdle throughout.

Touch Down

At touch-down, the hurdler's center of mass should be directly over or slightly ahead of the lead foot. The hurdler should land on the ball of the foot and not drop to the heel (which creates a braking action). This puts the athlete in position to drive forward off the ball of the foot into the getaway stride. The trail leg knee must drive forward, not drop to the side, for a long first stride to the next hurdle.

Sprinting Between the Hurdles

Unlike flat sprinting, in hurdle events, no two of the four strides used over and between two hurdles are the same. The getaway stride is relatively short. The second stride is the longest, and the third stride is a cut-step to accelerate the center of mass into the takeoff for the next hurdle.

Proficient high school hurdlers will take eight strides to the first hurdle and three strides between hurdles, so the hurdler with the quickest stride rate will have the greatest success if his or her technique is equal to that of their opponents.

Run-In After the Last Hurdle

In a close race, the hurdler who is first to return to sprint form off the last hurdle and best times his or her lean into the finish line, has the best chance of victory.

COMMON HURDLING MISTAKES AND CORRECTIVE TECHNIQUES

- Decelerates at the hurdle: Caused by a long stride into the takeoff. Correct by emphasizing attacking the hurdle with a short cut-step.
- Insufficient lean into the hurdle: Usually caused by a straight lead leg (driving the foot, rather than the knee, to the hurdle). Correct by emphasizing a bent lead leg and leaning the chest to the thigh as the knee drives to the hurdle.
- Off-balance at touch-down: Caused by shoulders turning as lead leg drives to the hurdle. Correct by keeping the shoulders square to the hurdle and driving the lead arm forward, head high and slightly across the body.
- Drops to heel at touch-down: Caused by **sitting up** on top of the hurdle. Correct by maintaining lean into touchdown.
- Wild straight-arm **paddle:** Caused by a **flat trail leg** recovery of the lead arm on the opposite side. Correct by bringing the trailing knee up under the arm pit and keeping the heel close to the hip.
- Cannot 3-step between hurdles: Caused by a short first stride which results from dropping the trail leg as it clears the hurdle. Correct by pulling the trailing knee through high and driving forward for a long first stride off the hurdle.

STAGES OF THE 300M HURDLES

Start to the First Hurdle

The hurdler uses a normal sprint start from the blocks. High school boys normally take 21–23 strides to the first hurdle, girls 22–24 strides. (22 strides to the first hurdle equates to a 15-stride pattern between hurdles.) When the hurdler takes an even number of strides to the first hurdle, the lead leg should be placed in the rear block. For an odd number of strides to the first hurdle, the lead leg is placed in the front block. The number of strides taken from the start to the first hurdle is a good indicator of the stride pattern to the following hurdles:

Strides to 1st Hurdle	Strides Between Hurdles	Required Stride Length
21	13	8'0"
21–22	14	7'6"
22	15	7'0"
22–23	16	6'6"
24	17	6'1"
25	18	5'5"

The speed to the first hurdle should be slightly slower than flat 400m pace due to the controlled stride pattern demanded by hurdling. The last three strides to the hurdle should be consistent in length, never chopped, and accelerate to the hurdle. It is essential that beginning hurdlers count their strides to establish their optimum stride pattern and rhythm. Rather than count each footstrike, a hurdler should count each time the takeoff foot hits the ground.

Hurdle Clearance

With the lower hurdle heights (36 inches for boys, 30 inches for girls), the forward lean required to drive the center of mass over the hurdle is minimal and the stride over the hurdle is not a dramatic departure from the sprint stride used between hurdles (see Fig. 114).

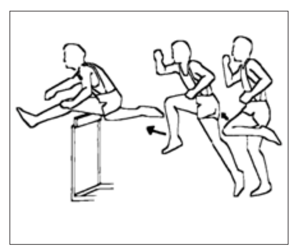


Fig. 11-4.
300m Hurdle Clearance

Strides Between Hurdles

A stride pattern of 15 to 17 strides is most commonly used by high school boys. For high school girls 17 to 19 strides is typical. It is essential to maintain rhythm and quick, efficient hurdle clearance to perform well in the 300m hurdles. **Stuttering** before any of the eight hurdles (chopping strides to bring the desired lead leg to the hurdle) will cause the hurdler to lose speed that can never be recaptured during the race. This event is a 300m sprint around a curve with a 180-degree change of direction and eight interruptions! The hurdler's stride pattern is going to be influenced by having to run into the wind, with the wind to the side, with the wind at the back, running around a tight curve in an inside lane or long curve in an outside lane, and by fatigue. The only way most 300m hurdlers can consistently maintain speed and rhythm in this event, hurdle-to-hurdle, race-after-race, is to learn to hurdle using either leg as a lead.

Hurdling on the Curve

Using a left lead leg is preferable because it allows the hurdler to run closer to the left (inside) border of the lane. Most important is clearing the center of the hurdle to avoid bringing the trail leg outside and below the plane of the hurdle, which will result in disqualification.

Run-In to the Finish Line

To counter the fatigue experienced in the final straightaway of this race, the 300m hurdler must make a conscious effort to accelerate into the last two hurdles.

HURDLE TOUCH-DOWN TIME CHARTS

An effective method to evaluate the various stages of a hurdle race is for the coach to record the athlete's touch-down times after each hurdle. The charts on the facing page cover a wide range of performances for boys' and girls' hurdle events.

Methods of Training for the Hurdle Events

CONSIDERATIONS IN TRAINING HURDLERS

- Hurdle training must emphasize the following areas:
  - Technique
  - Rhythm
  - Speed
  - Stamina
  - Ballistic strength
  - Flexibility

BOYS' 110m HURDLES											
TARGET TIME	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	FINISH TIME
13.6	2.5	3.6	4.6	5.6	6.6	7.7	8.8	9.9	11.0	12.2	13.6
14.0	2.5	3.6	4.6	5.7	6.8	7.9	9.0	10.1	11.2	12.4	14.0
14.4	2.6	3.6	4.7	5.8	6.9	8.1	9.3	10.5	11.7	12.9	14.4
14.6	2.6	3.7	4.7	5.8	7.0	8.2	9.4	10.6	11.8	13.0	14.6
15.0	2.6	3.7	4.9	6.0	7.2	8.3	9.5	10.7	12.0	13.2	15.0
15.5	2.7	3.8	5.0	6.2	7.4	8.6	9.8	11.0	12.3	13.6	15.5
16.0	2.8	3.9	5.1	6.4	7.6	8.8	10.1	11.3	12.6	14.0	16.0

GIRLS' 100m HURDLES											
TARGET TIME	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	FINISH TIME
13.8	2.5	3.6	4.6	5.7	6.8	7.9	9.1	10.2	11.0	12.2	13.8
14.0	2.5	3.6	4.6	5.7	6.9	8.1	9.3	10.4	11.2	12.4	14.0
14.3	2.6	3.6	4.7	5.9	7.1	8.3	9.5	10.7	11.7	12.9	14.3
14.8	2.6	3.8	4.9	6.0	7.2	8.4	9.6	10.9	11.8	13.0	14.8
15.0	2.6	3.8	4.9	6.1	7.3	8.5	9.7	11.0	12.0	13.2	15.0

BOYS' AND GIRLS' 300m HURDLES										
TARGET TIME	H1	H2	H3	H4	H5	200M SPLIT	H6	H7	H8	FINISH TIME
36.6	6.0	10.3	14.4	18.6	22.8	24.3	26.7	31.2	35.4	36.6
38.0	6.3	10.6	14.8	19.1	23.2	25.2	27.7	32.2	36.8	38.0
39.4	6.5	10.9	15.2	19.5	23.9	25.9	28.5	33.2	38.0	39.4
40.8	6.8	11.2	15.6	20.1	24.6	26.7	29.4	34.3	39.3	40.8
42.2	7.1	11.6	16.1	20.8	25.5	27.6	30.4	35.5	40.7	42.2
43.7	7.3	12.0	16.7	21.5	26.4	28.6	31.5	36.7	42.1	43.7
45.2	7.6	12.4	17.3	22.2	27.3	29.5	32.5	38.0	43.5	45.2
46.6	7.8	12.8	17.8	22.9	28.1	30.5	33.6	39.2	44.9	46.6
48.8	8.0	13.2	18.4	23.6	29.0	31.4	34.6	40.4	46.3	48.8

- Training must be adapted to meet the needs and skill levels of the athletes. Lower hurdle heights and shorter hurdle spacings should be used to allow novices to hurdle with speed and rhythm from the onset.
- Beginning hurdlers should be taught to lead with either leg. Many 13–14-year-old freshman/sophomore hurdlers have to 4-step and alternate legs in the 100m and 110m hurdle events. This is a skill that will serve all hurdlers well in the 300m event.
- Constantly emphasize hurdling is a sprint over barriers, and hurdle mechanics should deviate only slightly from sprinting mechanics.
- As soon as hurdlers become proficient with a drill, they should practice that drill at full racing speed. The hurdles are sprint events and little is accomplished by practicing hurdling slowly! A good method to ensure the hurdler trains at racing speeds is to use the touch-down timing charts in this chapter as a training guide. Coaches should take split times when the lead foot touches the ground after clearing each hurdle. Recording hurdle split times in training and races will help coaches pinpoint weaknesses in their athletes' performances and design workouts to address those weaknesses.
- Speed-endurance, or stamina, is an important aspect of hurdle training. Technique usually begins to deteriorate after the seventh hurdle, the point at which most races are won or lost. Hurdlers must train over six, eight, 10, and occasionally 12 hurdles to fully develop the stamina necessary for hurdling.

Stationary Hurdle Drills

Drills which isolate specific hurdling techniques should be part of every day's hurdle training. Introduce drills over low hurdles so basic hurdle mechanics can be practiced easily at sprint speeds.

- Lead Leg Punch-Ups (hurdle placed against a wall or fence):

  Hurdler takes one step into takeoff, driving the knee to the hurdle and unfolding the lower leg so the ball of the foot meets the wall or fence directly above the hurdle. Bent leg straightens out to thrust hurdler back to his or her takeoff mark (see Fig. 11-5).

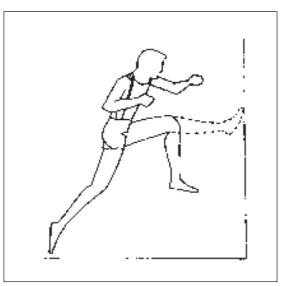


Fig. 11-5.
Lead Leg Punch-Ups.

- Trail Leg Circles (hurdle placed two feet from a wall or fence):

  Hurdler stands with the lead leg beside and forward of the edge of the hurdle, leaning forward with hands on the wall or fence. The trail leg is pulled through over the side of the hurdle high and tight, with the knee coming up underneath the armpit, the foot dorsiflexed with the small toe pointed up, and the heel drawn close to the hip. As the foot passes over the hurdle, the knee pulls through high and is driven toward the wall. The foot then sweeps down and begins another circuit over the side of the hurdle (see Fig. 11-6).

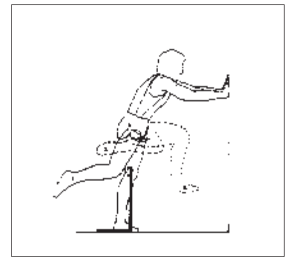


Fig. 11-6.
Trail Leg Circles.

Running Hurdle Drills

Over-the-Side Drills: 3–5 Hurdles

Lead Leg

- Quick-Step. Fast lead leg over the hurdle with five short prancing strides between hurdles.
- 3-Step. ¾ speed with shorter hurdle spacings.
- 3-Step. Full speed with normal hurdle spacings.
- 1-Step. Full speed with 10–12 foot spacings.

Coaching Points

- Active cut-step taking off into the hurdle.
- Quick lead leg attack of the hurdle.
- Knee drives to the top of the hurdle with the heel tucked under the buttocks and the foot dorsiflexed.
- High point of the takeoff trajectory is achieved directly above the hurdle.
- Lead leg aggressively *snaps down* coming down off the hurdle.

Trail Leg

- **Quick-Step.** Fast lead leg over the hurdle with five short, prancing strides in between.
- **3-Step.** ¾ speed with shorter hurdle spacings.
- **3-Step.** Full speed with normal hurdle spacings.
- **1-Step.** Full speed with 10–12 foot spacings.

Coaching Points

- Heel moves quickly to the buttocks as soon as the takeoff foot leaves the ground.
- Trail leg circles the hurdle without pause in one continuous motion from takeoff to touch-down.
- Trailing foot is dorsiflexed with the small toe pointed *up* throughout the arc of the trail leg.
- Trail leg knee is *pulled forward* and then the trailing foot *pushed down* during the clearance phase of the hurdle. (The hurdler should imagine the lead leg and trail leg are racing each other.)

Over-the-Top Drills: 3–5 Hurdles

- **Quick-Step.** Fast lead leg over the hurdle with five short prancing strides in between.
- **3-Step.** ¾ speed with shorter hurdle spacings.
- **3-Step.** Full speed with normal hurdle spacings.
- **1-Step.** Full speed with 10–12 foot spacings to the ground.

Training Periodization Plan for the High School Season

Training for all events should follow the concept of periodization which divides training into a cycle of several phases. Periodizing training allows hurdlers to emphasize particular types of training and skills during a specific period of the season. Other types of training are not neglected, but are emphasized less during that period.

The components of hurdle training are numerous and complex. As a rule, three to four weeks seems to be the maximum period during which athletes can sustain improvement with any one type of training. After that, training yields less improvement. During a two-to-four-week training phase, primary emphasis should be given to one type of training, secondary emphasis should be given to another type of training, and somewhat less emphasis (maintenance training) to a third.

Within any training phase, it is unwise to include more than three quality training days per week, including races. The remaining days should be easy training and recovery days.

Training is stress. When a coach is planning the training of a group of athletes, strong consideration should be given to how stress is going to be introduced and managed. Recovery is an essential component of all training because improvement occurs during recovery when the body rebuilds to adapt to the stresses that have been introduced.

TRAINING HURDLERS WITH A SYSTEM

A system of training uses several methods of training within a seasonal training cycle. The following is recommended as a hurdler's training cycle for the traditional high school track season:

2-4 WK PHASE		PRIMARY EMPHASIS	SECONDARY EMPHASIS
Preseason	1	Aerobic Running	Circuit Training
	2	Circuit Training	Aerobic Running
Early Season	3	Repetition Training	Speed Drills
	4	Repetition Training	Speed Drills
Mid-Season	5	High-Lactate Training	Speed Endurance
	6	Speed-Endurance	High-Lactate Training
Late Season	7	Peak Speed Training	High-Lactate Training

SUMMARY

Preseason
The training emphasis for hurdlers should be on *establishing an endurance base, enhancing rhythmic skills, strength and flexibility,* with some attention to speed.

Early Season
Training emphasis should be on *refining hurdling technique, sprint mechanics, general sprint conditioning.*

Mid-Season
Training emphasis shifts to *hurdle stamina* using drills and repetitions over 6–12 hurdles, and *sprint stamina* through interval training. Mid-season training should *conclude emphasizing speed* through quality sprint reps and hurdle drills at full racing speed.

Late Season
Hurdle training emphasis through the league, section and state qualifying meets should focus on *low-volume, high-quality technique training, recovery, and racing.*

PLANNING AIDS FOR DEVELOPING YOUR TRAINING SYSTEM

HURDLERS WORKOUT

Sequence Date:

RUNNING WARM-UP:

Pre-stretch plus:

FLEXIBILITY/MOBILITY EXERCISES:

❏ Static Series ❏ Swing Series

BUILD-UPS: **TECHNIQUE SPRINTS:**

STATIONARY HURDLE DRILLS:

Lead Leg Trail Leg Circles

RUNNING HURDLE DRILLS:

X 1-Step Drills over H

X 3-Step Drills over H

X 1 Alt. Lead Drills over H

X Fast-Step Drills over H

X Lean Drills over last H

WORKOUT:

❏ X Block Starts over H

❏ X Full Flights

❏ Hurdle Progressions

❏ Sprint Workout

WARM-DOWN:

RHYTHMIC PLYOMETRIC DRILLS:

POWER PLYOMETRIC DRILLS: Running - Bounding - Hopping

WEIGHT TRAINING CIRCUIT:

SAMPLE 100M/110M HURDLERS WORKOUT

Sequence Date: Mon April 9

1 **RUNNING WARM-UP:**

Pre-stretch plus: 1600m surging straights of last 2 laps

2 **FLEXIBILITY/MOBILITY EXERCISES:**

☑ Static Series ☑ Swing Series

3 **BUILD-UPS:** **TECHNIQUE SPRINTS:** 8 x 60m

4 **STATIONARY HURDLE DRILLS:**

10 Lead Leg 10 Trail Leg Circles

5 **RUNNING HURDLE DRILLS:**

5 X 1-Step Drills over 2 H

5 X 3-Step Drills over 2 H (9yd / 7.5m spacings for F-S)

X 1 Alt. Lead Drills over H

X Fast-Step Drills over H

X Lean Drills over last H

6 **WORKOUT:**

☑ 5 X Block Starts over 1 H

❑ X Full Flights

☑ Hurdle Progressions 2 x 3H-5H-7H

❑ Sprint Workout

7 **WARM-DOWN:** 800m

RHYTHMIC PLYOMETRIC DRILLS:

POWER PLYOMETRIC DRILLS: Running - Bounding - Hopping

8 **WEIGHT TRAINING CIRCUIT:**

SAMPLE 300M HURDLERS WORKOUT

Sequence Date: Mon April 9

1 **RUNNING WARM-UP:**

Pre-stretch plus: 1600m surging straights of last 2 laps

2 **FLEXIBILITY/MOBILITY EXERCISES:**

☑ Static Series ☑ Swing Series

3 **BUILD-UPS:** **TECHNIQUE SPRINTS:** 8 x 60m

4 **STATIONARY HURDLE DRILLS:** Both legs!

10 Lead Leg 10 Trail Leg Circles

5 **RUNNING HURDLE DRILLS:**

- X 1-Step Drills over H
- X 3-Step Drills over H
- 5 X 1 Alt. Lead Drills over 4 H (20yd spacings)
- X Fast-Step Drills over H
- X Lean Drills over last H

6 **WORKOUT:**

- ☑ 4 X Block Starts over 2 H (in lanes 5-6-7)
- ❑ X Full Flights
- ❑ Hurdle Progressions
- ☑ Sprint Workout 2 x (200m-30sec. rest-200m), 5 min. between sets

7 **WARM-DOWN:** 800m

RHYTHMIC PLYOMETRIC DRILLS:

POWER PLYOMETRIC DRILLS: Running - Bounding - Hopping

8 **WEIGHT TRAINING CIRCUIT:**

HURDLE TECHNIQUE CHECKLIST

Head and Chest

- Chest on thigh; chin in advance of knee.
- Head no higher than normal sprinting position.
- Eyes focused on the next hurdle at takeoff.
- Shoulders level and parallel to the hurdle.
- Hold forward lean until foot makes contact with ground.

Lead Leg

- Drive knee, don't kick foot, to the hurdle.
- Toe pulled back—not pointed at hurdle.
- Reach bent leg over hurdle.
- Begin snap-down when heel—not hips—reaches hurdle.
- Don't "hook" hurdle.
- Drive off ball of foot; don't drop onto heel.

Trail Leg

- Knee tucked under armpit—not flat over hurdle.
- Heel close to hip.
- Toe pointed forward—not back.
- Pull knee over hurdle; push foot to track.

Lead Arm

- Eye level at takeoff.
- Upper arm parallel to lead thigh.
- Arm bent 120-degrees during reach and pull-back.
- Hands sweeps back below trailing knee.

Between Hurdles

- Vigorous drive off hurdle into long first stride.
- Good high-knee sprint action on balls of feet.
- Slightly shortened last stride to hurdle.
- Takeoff approximately 7 feet from hurdle.
- Full extension from takeoff leg.

Chapter 12

Training Distance Runners

For high school athletes, the distance races are those events 800 meters or longer. The distances distinguish themselves from the other events in track and field by their reliance on aerobic fitness rather than raw speed or power. This difference requires special forms of training that demand a special dedication to training and competition. Distance runners develop gradually, often taking years to reach their potential. But like all athletes, distance runners must train not only for fitness but also to compete.

Training Distance Runners

Distance training begins with a simple concept. In order to develop as a distance runner, a young man or young woman needs to improve his or her cardiovascular system. In order to do this, they must learn to enjoy training. That enjoyment may take many forms: the joy of working hard to achieve a goal; the joy of working daily with teammates; or, of course, simply the joy that many athletes gain from running itself.

Some distance athletes come into the sport already enjoying the training aspect while others can eventually be taught to learn to enjoy distance running.

The are four distinct training periods that every successful distance program encompasses: a conditioning or base period, a pre-competition period, a competition period and a transition period.

The key for the continuous progression of a distance runner each season, each year and during their careers is to gradually, progressively increase the volume, intensity and duration of their workouts during each of the four training periods.

Done right, the runners will most likely remain healthy and fresh, show constant improvement and run their best races during the championship section of the season. Done wrong, the runners may become injured, fatigued, lethargic, and they may even digress rather than progress – not to mention they may run their worst races of the year during the championship season.

A Philosophy for Coaching the Distance Events

In some aspects, training distance runners may be the easiest coaching assignment in track and field. Basically, if a coach can get his or her athletes to run reasonably hard distance training every day they will be somewhat successful; however, it can also be the most difficult event area to coach due to the fact that if an athlete has been overtrained or undertrained by the time the championship season begins, there is not much the coach can do to remedy the situation. Training distance runners is not the same as with coaching a technique event, such as the pole vault or discus throw, where the coach and athlete can go out to the track and analyze and correct a problem in one or two training sessions.

Therefore, coaching distance runners requires a great deal of thought and preparation.

A coach must truly understand the demands of the events and the capabilities of the athletes under his or her care, along with possessing a sound philosophy that will help all achieve the goals set forth by the athlete, coach and team.

Creating a distance philosophy is not easy; in fact, it may be one of the most difficult tasks a coach may undertake, but if well thought out and carefully followed it can be the cornerstone of years of success.

First of all, that philosophy must fit within the scope of the entire track and field program. Second, it should be a philosophy that a coach can live with and turn to in times of question. And, finally, there are many different philosophies that can be successful – just because one coach's philosophy is successful at his or her school that doesn't mean that philosophy will be or should be right for another coach at another school.

Periodization for Distance Training

The key to being able to develop a sound distance training philosophy is to have a solid understanding of the concept of Periodization.

Periodization is the division of a training year into a cycle of several phases—each phase devoted to different training methods and objectives. Periodized training allows runners to emphasize a specific type of training during a phase within a year-long training program. Other types of training are not neglected during each training phase—they are simply less emphasized.

Conditioning Phase or Base Period:

Within the scope of the traditional high school year, the conditioning or base period is basically the summer months for cross country and the winter months for track.

It is important for a coach to understand during the initial development of the base period, the athlete will most likely be sore for a minimum of three weeks.

Training should begin easy and there should be gradual increases in the time or distance run during training sessions. All physiological gains are made during periods of recovery; therefore, it is important to build recovery or rest into this phase as well as every other training phase.

In this training phase, specifically, planned recovery is extremely important since the intensity of single workouts may not be as great as it is in other phases; however, the volume of work and the accumulative effect of that volume will take its toll (perhaps later in the competitive season) if proper recovery is not planned into the training.

All the basic principles of training come into effect during the base phase. Most significant are the overload principle, the law of accumulation and the principle of specificity.

An excellent guideline to follow in this phase is the "10% rule"– meaning after the initial three weeks of training, volume (miles or minutes run) should not increase much greater than 10% from one week to the next week.

In the base period, all facets of the training program are introduced. A week of training most likely would include a steady state (long run) day, a pace day, a tempo workout day, recovery days and a complete or active rest day.

A steady state day should be a continuous run accounting for up to 20% to 25% of the total weekly mileage or time run.

Pace day should include running at "race pace" or faster for segments of between two minutes to six minutes.

Tempo days could very easily be referred to as the oxymoron of workouts. That is because tempo pace is best described as "comfortably hard." A good guideline for the pace to be run during tempo work is one minute slower than three-mile race pace. For example, if a girl can run a three-mile race in 19:30 her race pace would be 6:30 per mile; consequently, her tempo workout pace would be approximately 6:50 to 7:00 per mile.

The tempo portion of the run should be between 10 and 20 minutes for most runners. The more experienced and more fit the runner, the longer the duration of the tempo portion of the run can be.

Recovery days are best described as easier runs done at a decent, comfortable pace. A good guideline for the pace to be run during recovery work is two to three minutes slower than three-mile race pace. Once again, for the girl who can run a three-mile race in 19:30, her pace for recovery workouts would be approximately 7:30 to 7:45 per mile depending on the distance of the run.

Along that line, one important aspect of recovery running a coach should monitor closely is recovery runs should not simply be slow jogging done at 10 minute or slower per mile pace. Even if athletes are doing a recovery workout, they can still make gains in cardiovascular fitness if the run is not done "too slow."

Recovery runs are usually placed in the overall training schedule immediately following hard training days—this follows the hard/easy principle first established by Bill Bowerman at the Univeristy of Oregon. This hard/easy principle allows time for the body to recover. It is not uncommon to plan for two easy recovery days in a row if the coach observes his or her runners are not sufficiently recovered from the previous hard workout.

A sample week workout during the base period might follow this schedule:

Monday:	Steady State (Long) Run
Tuesday:	Recovery
Wednesday:	Pace
Thursday:	Recovery
Friday:	Tempo
Saturday:	Recovery
Sunday:	Active Rest Or Complete Rest

The most important part of this conditioning phase of training is to work on the weaknesses both of the team and the individual runners. The primary weakness for most athletes at this time is usually their cardiovascular fitness; thus, the primary goal of the base period is to get the athletes in better shape.

Pre-competition Phase:

After creating the base, the athlete's training should transfer into the pre-competition phase. While this phase may actually include some early season competitions, the purpose of this phase is to physically and mentally prepare the body for racing on the track.

In this phase, aerobic capacity should continue to be enhanced. Weekly running time or distance should continue to be increased as the quantity and quality of pace segments and the length of the steady state run should also be increased; however, it is important to note that coaches should not increase intensity and duration on the same day. One week, there can be an increase in the intensity of the workout and the following week, the distance of the segments run or the total workout can be increased.

Race simulation and race tactics should be introduced into workouts in this phase. Examples of this type of training would be running segments of 100, 200, 300 or 400 meters at race pace daily so the muscles are educated as to race pace.

Surging runs, race starts, race finishes, effective running mechanics and proper pre-race workouts are all important aspects to add to the athlete's racing arsenal at this time.

Race pace workouts can be run using three speeds: date pace, goal pace and dream pace.

Date pace is the actual pace the athlete is running presently in races. For example, if a boy is currently running 4:44 for 1600 meters during his races his date pace is 1:11 per 400 meters.

Goal pace is the realistic expectation for middle to late season race times. If our same boy currently running 4:44 for 1600 meters realistically can run 4:28 by mid-to-late season, then his goal pace is 1:07 per 400 meters.

Dream pace is the ultimate goal of the athlete for this season. Our current 4:44 1600 meter runner may have aspirations to break the 4:20 barrier this season—his dream pace would then be under 1:05 per 400 meters.

Both the coach and the athlete need to have input in determining the goal pace and the dream pace. While it is wise to be a tad conservative on these predictions, the enthusiasm of the athlete who is willing to do the work should never be stifled.

As the athlete becomes more fit, it is important for the coach to encourage negative split runs. Negative split means running the second half of the run faster than the first half. The purpose of this training is while many runners can perform extremely well early in the races, few athletes can maintain the same cadence during the middle or latter portions of a race. If athletes perform negative split runs, they will be teaching their bodies to run faster and more efficiently when the body is fatigued.

Another way to enhance the ability to run fast when tired is to do race pace or faster strides at the conclusion of the run or workout.

A weekly schedule during this period might include the following:
One steady state (long) run day
One pace day
One tempo
One race day
One pre-race day
Two recovery days.

The week might look like the following:

Monday:	Steady state (long) run
Tuesday:	Recovery day
Wednesday:	Pace day
Thursday:	Light hill day or recovery day
Friday:	Pre-race day or recovery day
Saturday:	Race day or tempo run
Sunday:	Active or complete rest day

Competition Phase:

As the athlete moves into the competition phase of the season, competitive success is emphasized. The length of individual workouts and the total weekly mileage or time is maintained or slightly decreased. Pace workouts should have achieved a load of race distance or slightly longer. The pace run should become faster and recovery time allotted between segments should be gradually reduced. The steady state run is still a staple of the program, but the distance is gradually decreased as the pace is increased.

Tactics become more important as the athlete learns from his or her race experiences. During this part of the season, athletes start focusing on their individual race strengths with coaches helping train athletes to use those strengths in races.

Early in the competition phase, many athletes may be running two competitions a week – a dual meet during the week and an invitational during the weekend. There is no more intense workout than a hard race, so coaches should factor that into an athlete's season training plan. In a week where an athlete must race hard two of those seven days, the other training days of that week may incorporate only recovery, pre-race and post-race days with little other types of work.

Early season competitive phase week;

Monday:	Steady state run (during the competitive phase it may sometimes take 10 days to two weeks to schedule in the steady state run.)
Tuesday:	Moderate pace
Wednesday:	Pre-race
Thursday:	Race
Friday:	Recovery
Saturday:	Race
Sunday:	Active rest or complete rest

Championship portion of competition phase week:

Monday:	Moderate run
Tuesday:	Pace
Wednesday:	Recovery
Thursday:	Moderate pace (condensed portion of pace workout) or tempo run
Friday:	Pre-race
Saturday:	Competition
Sunday:	Rest

Transition Phase:

Following the end of the championship season, distance runners must transition from track to prepare for cross country.

The first portion of the transition phase is a good time for athletes to take a complete break from running. Many athletes take 14 to 21 days off to allow the body and mind to heal. Some do alternative forms of exercise such as cycling, swimming or various exercise machines. Others just rest.

Obviously, aerobic capacity will slightly decline while the athlete is resting; however, the body and the mind may need some healing during this time.

After this break from training, the athlete can begin with easy running to work back into the daily effort needed to be successful. That easy running will transition the athlete into the conditioning phase for the next season to once again rebuild and extend the athlete's training base. The bigger the base, the more consistent the peak tends to be at the conclusion of the next season.

Universal Principles of Training

Training for all events should recognize the following principles:

Overload

The body makes a *Specific Adaptation to gradually Imposed Demands.* As discussed in previous chapters, this is the **SAID** principle. In very simple terms, overload means increasing the volume or increasing the intensity of the workout. Over time, the body will adapt to a certain load. If the load is not gradually increased over time, the athlete will no longer progress with the same load. The basic belief is that for most athletes it takes somewhere between 21 and 28 days to adapt to a certain training load. The overload principle should also be applied during the career. Each year, for most athletes, the load should be increased by approximately 10%.

Allowance for Recovery

Training must provide days of rest and recovery. Improving the quality of an athlete's "hard" training sessions enhances racing fitness. However, distance runners must recover from *yesterday* to be able to train hard again *tomorrow*! Training hard for several days in succession inevitably leads to injury, illness, or loss of motivation. All physiological gains are made during periods of rest. It is important to note that rest is not an absence of training but part of training.

Toughening or Callousing

Part of an athlete's training must prepare him or her for the demands of all out racing. Runners have to do some training at maximum effort almost year round. Mental toughening is also an important part of training. Part of the steady state or long run for distance runners is to help them become mentally calloused for the demands of a fast paced distance race. Likewise, it is important to have distance runners do something at race pace or faster at the conclusion of almost every distance workout.

Additionally, most track distance races start extremely fast. Distance runners should surely do some training that mimics the fast start they will encounter in virtually all races on the track; however, it is the athlete who can maintain pace in the middle and accelerate at the end of a distance race who seems to find more racing success. It is extremely important to teach the body to run fast when tired.

Specificity

To be effective, training must be specific to the demands of the event. Thus, in order to be a successful distance runner, an athlete must prepare by doing distance workouts.

Also, if an athlete is going to double in a meet, it is important to train specifically for this occurrence. Included in the law of specificity is teaching distance runners the proper start and finish techniques for races. Proper lane usage is also a specific skill needed to be a successful distance runner.

Law of Accumulation

While not one of the universal principles of training, the law of accumluation is an important concept to teach a distance runner. The quality and quantity of workouts help improve the aerobic capacity of a distance runner. Each and every run, race and workout add to this law of accumulation. With each and every season of running, the distance runner expands his or her ability to train. Thus, days and seasons running add up. This is why most cross country coaches would like their team members to participate in track and field and most distance coaches in track and field strongly encourage their athletes to participate in cross country. Other sports can also help with the law of accumulation, but cross country and track and field best help to adapt to the law of specificity when it comes to distance running.

Gender Considerations

This is also not one of the universal principles of training, but both training age and gender should be considered when preparing workouts. Training age (years an athlete has specifically been training to be a distance runner) rather than chronological age should be the primary concern in determining training loads. Sometimes coaches forget that mature looking freshmen or sophomores may have never trained as a distance runner before. Even though those new athletes may have the speed to keep up with the veteran runners, the volume might do them in over the next several weeks.

Young female runners are often capable of keeping up with the veterans in races and sometimes workouts. Once again, it is important to consider the training age of the female athlete when determining her volume.

It is far better to undertrain young athletes. This usually ensures a longer, more productive career. Most athletes can see a 2 to 5% improvement in performance each year. Probably the greatest improvement for both male and female athletes will come during the second year of competition.

Basics to Teach for Racing Success

A. Race warm-up

Race warm-up should be similar to the warm-up for a pace or interval day. The core temperature of the body needs to be increased and athlete should be ready to race when he or she gets to the starting line.

Warm-up is completely different with each athlete. Some runners need very little warm-up and they are ready to go; in fact, longer warm-ups may actually hinder their performance. On the other hand, other runners may not only need longer warm-ups but also warm-ups of higher intensity.

Coaches should have athletes experiment with longer and shorter and higher and lower intensity warm-ups in pre-competition training sessions to determine which type of warm-up works best for that athlete.

B. Race starts

The body has three basic energy systems: the alactic, the aerobic and the anaerobic systems.

The alactic system is a very quick energy system that is sometimes used when a person is frightened. The average athlete has about eight seconds of this energy stored in the body. If it is not used at the beginning of a physical effort, it basically is lost and cannot be used at any other time. Therefore, athletes should be taught it is important to start a race fast for the first five to six of those eight seconds before settling into pace – doing so will not negatively impact how the body responds physiologically throughout the remainder of the race.

C. Race cool-downs

To enhance recovery, an athlete should begin a cool-down within five minutes of the conclusion of the a race. A very simple distance cool-down is to walk one lap, jog two laps and then stretch out the body.

D. Preparation for a second race

The second race of the day in a track meet will require less warm-up than the first. However, the athlete will probably not feel as good warming up for, or at the beginning of the second race. It is important to remind the athlete that this feeling will go away in the early portions of the race, provided the athlete did a proper cool-down after the first race and a significant warm-up prior to the second race.

Tactics to Teach

A. Race starts

There are a variety of race starts.

Coaches should practice often with their athletes the abbreviated commands used by a starter for a distance race, 800-meter staggers and moving in on the back stretch, waterfall starts, and what to do if there is a recall at the start.

Even though a runner's starting position in a distance race is certainly not as important as in a sprint race, distance runners should be taught to place their "smart' foot back (see Sprint Section) and have their "strong" foot in a flat-footed position on the start line.

B. Surges

Surges are moves in the race where the pace is picked up in an effort to break away from a pack or an individual or to pass an opponent.

Athletes cannot just decide they want to surge in a race—their workouts should simulate surging to prepare athletes both physically and mentally to put in surges and to be able to react to them if their opponent tries surging.

Between surges, the runner should settle back into race pace.

C. Long kicks

Kicks at the end of the race are usually not based on all out speed. They are usually based on strength. While some runners have more fast twitch fibers allowing them more top end speed, many runners spend time developing strength over a greater distance. Thus, those with more strength rather than flat out speed tend to use a longer kick. Some may start their finishing acceleration up to 800-meters prior to the finish of the race. Many wait until the last 100 meters to use the "kick." The long kick can occasionally eliminate the effectiveness of the short kick.

D. Taking the kick out of the kicker

For those runners who do not have the huge kick, they should try to push the pace early in the race to put a gap between themselves and the kickers or to wear the kicker down so his or her kick is not as strong at the end of the race.

As with all tactics, coaches should simulate this tactic during practice. A good way to practice this is to start the first two or three segments in a repetition or interval workout at three to five seconds faster than race pace.

E. Turns

There are different philosophies on turns. Some coaches request their athletes never pass on the curve as it requires the runner to run a longer distance. Other coaches like the element of surprise by passing on the curve.

A good tactic to teach runners is how to move on the curve and how to protect space on the curve. Thus, if and when the athlete needs to either move on the curve or protect position on the turn, it will be something he or she has already practiced.

F. Race plans

All athletes should have a race plan for every race they run. This race plan should be mentally practiced at least two days prior to the actual race. Additionally, there also should be an alternative race plan in case the original plan changes in the middle of the race.

Types of Racers

A. Front runner

Front runners are athletes who like to push the pace from the beginning. Steve Prefontaine, one of the United States greatest distance runners ever, was a front runner. Front runners seem to be more successful on the female side.

B. Push in the middle

Usually someone who pushes the middle of the race maintains contact with the lead back through the first portion of the race. If the race is an 800, the middle push may be from the 300 mark to the 500 mark. For the 1600, from 600 to 1000 is the usual area of the “middle” push. The 3200 may see a movement at the 1000 and then again at the 2000 mark of the race.

C. Sit and kick

A tactic used many times against a “front runner.” A sit and kick type runner needs to maintain contact with the leaders or a specifically identified opponent in order to be close enough to use the kick at the end of the race. Kicks are of varying distances. This is a tactic that sometimes backfires for the better runners as the leaders gain confidence and may find a kick of their own at the end of the race.

D. Negative split

Running a negative split means running the second half of the race faster than the first half of the race. While runners can be successful with this tactic if they have a tremendous sense of pace, most runners tend to fall into the rhythm of the race. It is seldom used to win championship races unless the negative split runner is considerably better than the field. This tactic should be practiced on pace days in order for it to be successful.

E. Run for time

This is a very good tactic for beginning runners to learn the cadence of the race. If the goal is to hit a certain time, runners can shoot for specific splits as the race progresses.

Today, with the increased use of qualifying times in many state and section meets, running for time might also be an excellent tactic for elite runners.

However, it should be stressed to young athletes that at the conclusion of the race they should be racing the competition instead of the clock.

F. Never up, never in

In almost every high school mile or two-mile race on the track, the eventual winner of the race can be identified as one of the runners in the lead pack just prior to the half way point.

This requires all athletes who feel they have a chance to win a race to stay in contact with the lead pack; therefore, the goal is to stay in contact with the leaders of the race – "to stay up in the pack."

This is a tactic where an athlete needs to be keenly aware of the circumstances that unfold in a race. If the lead pack moves out at a pace that is obviously too fast, athletes need to recognize that fact and not get "sucked" up into that pace; however, to allow the front pack to build up a tremendous lead may cost the athlete at the end of the race. Athletes need to be cognizant of what is happening in a race and recognize when the leaders are going faster than anticipated; therefore, a plan to “split the difference” is appropriate. The athlete doesn’t go with the upfront leaders running too fast of a pace, but he or she also does not sit back and stay cemented to his or her original race pace plan. The athlete “splits the difference” by picking up his or her originally planned pace to stay close enough so when the lead pack does settle down, he or she is close enough to rejoin the pack without expending too much effort.

G. Even splits

Although difficult to do in the light of the uneven splits run in most high school races, even splits is physiologically the most efficient manner in which to run a race.

Most races go out too quickly, slow in middle, and then finish in a flurry. If an athlete is able to run even splits, theoretically, he or she should have more energy at the conclusion of the race.

Running even splits requires a great deal of patience at the beginning of the race as the field pulls away. Most runners, lacking experience, do not have enough confidence or knowledge of pace to make the even pace happen; however, when this tactic is learned, it can be extremely successful

H. Running for the team versus running as an individual

In many track meets distance runners are often called upon to run as many as three or four races in a single meet for the team to be successful.

In order to be strong in later events, a distance runner may run slower than his or her best effort in order to score points but conserve energy for efforts later in the meet.

Even in these “easier” efforts, athletes need to begin each race with a solid race plan as to how to accomplish the goal. Many inexperienced high school runners may have trouble with this concept and actually expend too much energy in running a race that is different than normal.

This is a tactic that needs to be “rehearsed” in preseason meets before a team really needs to use it in a “big meet.”

Running Terms

800 METERS, 1600 METERS, 3200 METERS

The different methods of training for distance races vary in purpose, intensity and duration. The specific demands of racing at distances of 800–3200 meters and a runner's strengths and weaknesses should determine what that specific runner should do in training.

As a rule, early season training should target areas of weakness and late season training should focus on exploiting the athlete's racing strengths.

Regardless of the methods, the key to an effective training program is detailed planning, the judicious use of rest and recovery, and a gradual increase in training intensity and duration.

Steady state training

Steady state runs are long runs that should be done at a pace that can be maintained for 40–60 minutes with relative ease. Scientists estimate the ideal intensity for a steady pace run is a pace equivalent to 70% of the individual runner's VO2 max (approximately one minute per mile slower than 10K race pace).

A 40–60 minute continuous run at this level of intensity has been found to be ideal for developing the cardiovascular system, improving the capillarization of muscles, and enhancing the body's efficient use of its energy sources.

These long, steady run periods of training programs serve as the "base" or "foundation" that is absolutely necessary to allow for longer, more intense training later in the training cycle.

It is important coaches not fall into the "more is better" philosophy when dealing with steady state training. While increased volume is certainly helpful, too many miles tends to destroy the snap in the legs and the excitement in the brain; furthermore, there is substantial evidence to indicate that extensive miles run at a young training age can actually reduce the additional capillarization that will occur during heavy training when an athlete reaches physical maturity.

TEMPO PACE (THRESHOLD) TRAINING

Tempo pace (threshold) running is designed to train runners at their **lactate**

threshold–the level of running intensity where lactic acid begins to accumulate rapidly in the blood. Continuous running at tempo pace usually can be maintained for 20–30 minutes. Theoretically, regular threshold training will enable the runner to maintain a faster race pace with no greater accumulation of lactic acid.

Threshold training can be either continuous or segmented. Continuous threshold training is usually referred to as **tempo running**. Tempo runs are typically 20–30 minutes at a pace about 20 to 40 seconds per mile slower than 5K race pace, with warm-up and cool-down running included before and after the run. The purpose of tempo runs is to train at an intensity level just short of **hard pace** running.

Segmented threshold training is also referred to as **tempo repetitions** or **tempo intervals**. This training consists of a series of shorter segment runs, usually lasting 90 seconds to eight minutes, with short recovery periods of one-minute or less in between. Distances of 600–2000 meters are best used for tempo repetitions. A entire tempo interval workout could last as little as 30–40 minutes, including recovery time.

REPETITION TRAINING

Repetition training can be defined as repeated running segments of varying distances with the rest period between the segments being approximately twice the length of time as it took to complete the previous running segment.

Repeated segments of one to six minutes of fast running have been identified by exercise physiologists as ideal repetition training for distance runners. Repetition training is designed to increase running efficiency by decreasing the **oxygen cost** of running and to help the runner become more pace and rhythm conscious.

The running intensity used for repetition training should be desired race pace. Repetition training allows the athlete to attain and sustain VO_2 max repeatedly. Repetition training enables a runner to train at $V0_2$ max for a cumulative period of time greater than could be sustained in a single race. A total time of 20–25 minutes, not including recovery time, is a good upper limit for a repetition training session.

INTERVAL (HIGH LACTATE) TRAINING

Many coaches and athletes use the terms “interval training” and “repetition training” interchangeably, but they are vastly different types of training. What is the interval in a workout? The **interval** is the recovery period between bouts of running.

In a repetition training session, the objective is to run specific segmented distances repeatedly at race pace, so the recovery ratio is approximately 1:2 run to recovery time. In an interval training session, the objective is to run specific segmented distances repeatedly at a high lactate blood level, so the recovery ratio is 2:1 run to recovery—in other words, the time rested (interval) between running segments is half the time it took to run the previous segment.

Interval training should be included more often in the training of 800m and 1600m runners than 3200m runners because those races are 30–50% anaerobic. Research has shown that middle distance runners need to be able to tolerate high levels of lactic acid because it is a byproduct of anaerobic running. Research also shows that middle distance runners must be able to produce high levels of lactic acid because it becomes an energy source in the absence of oxygen via the **Krebs cycle**.

The intensity of interval training should be faster than race pace because its purpose is to produce lactic acid by performing the last portion of each run anaerobically. The duration of each segment run in an interval session is typically 15–90 seconds (100–600m). The recovery ratio should be 1:1 or 2:1 run to recovery. The idea is not to fully recover but to maintain a high level of lactic acid in the blood throughout the workout.

The purpose of interval training is to enhance the athlete's ability to produce and tolerate lactic acid during a race. Interval training is intense, demanding, and painful. It should not be included more than once a week in a training plan, and some athletes may require two to three days of easy running to recover fully from a hard interval training session.

SPEED PLAY ("FARTLEK") TRAINING

"Speed play" is the literal translation of the Swedish word *"fartlek."* Speed play is a combination of fast and slow running; that is, a continuous running session that includes bursts of fast running followed by periods of easy running for recovery. Ideally, speed play is done over varied terrain, including hills. The length of the fast bursts and easy recovery runs is unstructured so the athlete has a genuine feeling of **playing with speed.**

Using the above definitions of repetition and interval training, the speed and rest intervals in a fartlek workout determine if that specific workout is a repetition or interval workout.

SURGING TRAINING

Surging is continuous running similar in design to speed play; however, while speed play alternates periods of sprinting and jogging, surging is steady-pace running punctuated with periods of faster running up to threshold pace, well below sprint speed. Typically, a surge in the midst of a steady-pace run would be an increase in pace of 30–60 seconds per mile, depending on the length of the surge.

The purpose of surging training is to enhance the runner's ability to initiate and respond to changes in pace and to recover at steady-pace running speeds.

STRIDES:

There are a variety of strides a distance runner might use during a workout week. Usually, strides are done at the conclusion of a warm-up or at the conclusion of the day's workout. Strides may be done at start pace, race pace, surge pace or just a little faster than that day's particular run pace. Strides can also be done in order to focus on proper running mechanics.

Whatever the particular purpose of the strides, the athlete should focus on that specific purpose. Done right, strides can be used to reinforce proper technique and a variety of race tactics. Done incorrectly an athlete can reinforce improper muscle memory and create bad habits. Quality rather than quantity should always be the goal for strides. While they add little to the total volume of the day, strides can greatly improve the performance of an athlete.

WARM-UP:

A proper warm-up for a distance runner should start with six or more minutes of easy running. During this time period, the pace can be varied; however, since the primary function of the warm-up is to increase the core temperature of the body, it is best to have the warm-up run go from slow to faster.

After the conclusion of the running warm-up an athlete should go right into form drills which can further help to warm-up the athlete while at the same time be used to help teach proper running technique, foot placement and help build running strength.

Upon completion of drills strides can be included. Some longer strides – as much as 300 meters – may be included.

At the conclusion of this complete warm-up, athletes will then go directly into their running workout.

Static stretching should be done at the end of the workout.

Coaches should have athletes experiment with their warm-ups during workouts and preseason races. Some athletes need much more warm-up than others to race effectively.

COOL-DOWN AND STATIC STRETCHING:

After the conclusion of the running workout, athletes should gradually bring their heart rate down. Four or more minutes of light jogging followed by a systematic approach to static stretching can help the athlete improve range of motion and greatly aid with recovery. Note that static stretching is suggested at the conclusion of the workout well after the core body temperature is completely warmed up.

BODY STRENGTH EXERCISES:

While it would be great to have every distance runner in the weight room for a major muscle group strength workout, the SAID principle and the lack of time may make this difficult.

For the vast majority of distance runners, it is more important to run and learn proper running techniques than to use valuable training time in the weight room.

Core strength exercises and body weight resistance exercises can help improve the strength of a runner and these can be done quickly and efficiently outside of a weight room during practice. Sit-ups, crunches, bicycles and a variety of abdominal workouts can help strengthen the core muscle area. Push-ups, push-up variations, pull ups and bar dips can help improve upper body strength.

As with distance workouts, these workouts should be periodized. Start gradually and increase the volume over the course of the year. Also, coaches should demand these exercises be done correctly as muscle memory is just as important in these activities as in running mechanics.

Teaching Distance Running Mechanics

The body moves as a system of levers. Each of the body's levers (the head, torso, arms and legs) obeys the laws of physics and motion. The three primary components of running mechanics are posture, arm-action, and footstrike.

RUNNING POSTURE

Distance runners should not be told to try to lean forward. Forward lean is simply a function of acceleration. When the body accelerates, it will lean forward. Acceleration is accomplished in the first several strides of a distance race. After that, the position of the torso should be erect, directly above the hips. When an athlete is running, each leg swings forward-and-back like a pendulum. The sweep of that pendulum swing is the length of the stride, which is largely determined by the height to which the knee swings forward.

When running erect, the weight is centered in the body just above the hips. Leaning forward lowers the center of mass. You cannot lift your knees any higher than your center of mass (one of the laws of motion), so lowering the center of mass by leaning forward restricts knee lift, which in turn decreases the length of the stride.

WHAT TO TEACH

Teach athletes to run *erect*, with the torso directly above the hips, head up, chin slightly tucked, chest out, shoulders back.

ARM-ACTION

The arms get everything moving in the direction a runner wants to go—forward. Swinging the arms past the mid-line of the body, causes the shoulders to rotate, restricting the free swing of the hips. Athletes who shrug their shoulders during arm-swing also create shoulder rotation.

To keep the shoulders *square* while running, the arms should move forward and back with the hands moving forward from a point just behind the hips, slightly across the chest, up to a point near the shoulders. The forearm and hand should move forward and back as one piece because flexing the wrists reduces the effectiveness of using the arms as levers by turning the elbows out. The hands must stay relaxed and cupped; clenching fists causes the body to tense up thus reducing stride length and slowing the runner.

The arms control running. A runner's pace is set by the cadence of the armswing. However, distance runners cannot run with vigorous arm-action without paying a high energy cost, so conserving energy must be a primary objective of arm action.

WHAT TO TEACH

The arms should swing forward and back with a constant arm angle of approximately 90-degrees until the final stages of the race. The hands should be cupped and relaxed.

FOOTSTRIKE

Shoes significantly alter a person's natural footstrike tendencies. Most runners would not land on their heels and slap their forefoot onto the ground if they were running barefoot. Today's super-cushioned shoes allow runners to make those kinds of mechanical mistakes. A heel-first footstrike extends the foot in front of the center of mass and creates a braking action at each touch down. This is called "overstriding." The middle of the foot should strike the ground with the runner's weight toward the ball of the foot and the toes dorsiflexed. A *full-footed* footstrike puts the foot under the hips with the leg in a bent, weight-bearing position. This enhances a rapid forward weight transfer as the leg fully extends off the ball of the foot into the next stride.

Important! Accelerating off the pace requires different mechanics than accelerating from a start. Many distance runners attempt to run faster in the closing stages of a race by taking longer strides. This results in overstriding and a loss of speed. The key to accelerating off the pace is to create shorter, quicker levers. This is achieved by closing the arm angles, increasing armswing cadence, and shortening the stride. Running with the hands positioned *thumbs up* recruits more muscles in the forearm and shoulder to flex the arm rapidly.

PUTTING IT ALL TOGETHER

Many young runners do not have a good feel (kinesthetic sense) for how their bodies move. Even those who do often lose that sense once they become fatigued. A coach should teach and reinforce proper running mechanics—this must be a constant, ongoing process if athletes are to acquire efficient, rhythmic, symmetrical running mechanics. Coaches must develop a critical eye for proper mechanics, correct errors, and praise progress.

The Three Distance Races

800 Meters:

Some people look at the 800 as a long sprint while others look at it as a very fast distance race. Whatever the concept of the race, realize the 800 is the distance race that requires the athlete to spend a great deal of time in an anaerobic state; therefore, this should be emphasized during training. While these athletes certainly need an aerobic base, they also need to be on the track dealing with the discomfort of running in oxygen debt.

Usually, 800-meter runners are trained in two different groups: the 400-800 runners and the 800-1600 runners—or the sprinters moving up or the distance folks moving down.

The 400-800 folks will train very much like a 400-meter sprinter with some longer distance repetitions in the workout. The 800-1600 will train more like a 1600-meter runner with less distance and more intensity on the repetitions.

While many coaches and athletes tend to break this race into four segments of 200 meters, another more practical approach is to break it into three segments.

The first segment is approximately 300 meters. During this segment, it is important to maintain contact with the lead runners (or runners of like ability). While the racer needs to get out quickly, he or she needs to be somewhat under control. Very seldom does the leader of the first lap of an 800 win the race unless that racer is just the class of the field.

The second segment of the race is approximately 200 meters long. This is from the 300 mark to the 500 mark. Here, the racer can push the pace of the race or maintain effort and get into a strong position to set up the final segment of the race which is a 300-meter cut down.

On a cutdown, the goal is to run each 100 meters just one second faster. With this build up, the racer can accelerate over a long period of time and gradually pull away from like ability opponents. This approach also helps the athlete segment the race and focus on three shorter segments rather than the full race.

Emphasizing the final 300 meters as a "cutdown" will especially help the 1600-meter runners who are accustomed to running the final 300 meters of a distance race close to all out. The cutdown will help them to understand how to finish an 800 without severely "tightening up" in the final 100 meters.

If a coach or athlete plans on using the 3-2-3 segmenting of the 800, it is important that he or she also break the pace workouts into similar segments.

Sample week for a 400/800 runner:

Monday:	Workout with the sprinters or hill work
Tuesday:	Repetition work with the distance runners with less volume

Wednesday:	Moderate distance run, concluding with 150 meter sprint-float-sprints
Thursday:	Light sprint day
Friday:	Premeet or short distance run
Saturday:	Race. Depending on goals and time of the season, race distance could be anywhere from 200 meters to 1600 meters. Most likely a leg on the 4 x 400 relay will be included.
Sunday:	Complete rest

Sample week for an 800-1600 meter runner

Monday:	Moderate steady state run with distance runners. Finish with strides.
Tuesday:	Repetition work with distance runners. Finish with faster strides than pace of repetition work.
Wednesday:	Moderate distance run. Finish with cut down strides at both 800 pace and 1600 pace.
Thursday:	Race pace work for 800. Possible sets of 200s or 300s.
Friday:	Pre-race or moderate distance run day.
Saturday:	Race. Distances can be from 400 to 3200 meters. If the goal is for a fast 800 as the season progresses, probably more emphasis on the 4, 8 and 16. Should run a leg on the 4 x 400 relay for speed development.
Sunday:	Light distance run or complete rest

1600 Meters

The 1600 meters is often considered the premier high school distance race. More of the top-level distance runners tend to focus on this event; thus, the quality of the fields in big 1600 races tend to be deeper than the quality of the fields in the other two distance races.

Just as in the 800, the 1600 can be segmented into different portions. Traditionally, coaches and athletes tend to break the race into 400-meter segments or 200-meter segments. Traditionally, during a high school 1600-meter race, there are a couple of break points (a point in the race where the leaders open up a gap on the field) between 500 and 600 meters and again between 1000 and 1200 meters.

Rather than the traditional 200 or 400 meter segments, a more practical break down might be 600-400-600. In this plan, the runner stays in contact with the leaders through the first 600 meters, maintains goal pace for the middle 400 meters and then uses 200 meter cut downs over the final 600 meters.

During that final 600 meters, the first 200 meters might be at goal pace or one second under, the second is just a second faster and the final 200 meters is at least one second faster than the previous 200. This is a subtle way of picking up the pace and possibly removing the huge finish from the big kicker.

Traditionally, the race slows after the 500-meter mark, so if an athlete is able to maintain pace through this portion of the race, he or she can force the pace of the race. Unlike the 800, where one false move may leave the racer out of the hunt, the 1600 allows more time to make up for an early racing error.

As with the 800, whatever segmenting an athlete or coach chooses to use, this segmenting should be practiced often during pace day. For veteran 1600-meter runners, the volume of actual pace work may be anywhere from two times to 3.5 times the race distance during one workout.

Sample Workout week for 1600-meter runner-Mid season:

Monday:	Steady state run
Tuesday:	1600-meter based pace workout
Wednesday:	Recovery day finishing with 100-meter strides at 1600-meter goal pace
Thursday:	Tempo day or shortened pace workout
Friday:	Pre-race or Recovery Day
Saturday:	Race day or moderate distance day
Sunday:	Rest day or recovery day

3200 Meters

The 3200-meter race has increased in popularity and depth in recent years. With the increase in the number of quality cross-country teams, there has been an increase in the quality of the athletes involved with the 3200. No longer is the 3200 the place to which the runner with less leg speed is relegated.

The 3200 requires more volume in both daily workouts and in pace workouts in order for a runner to be successful. Thus, the steady state run (which is usually 20% to 25% of the weekly volume) tends to be longer.

Tactics also become more significant in the 3200 and should be practiced regularly. A common practice in elite 3200-meter races involves running a negative split pace, with the pace starting to drop with each lap after the first 1600 meters

Most 3200-meter high school races have break points in the race at 1200 meters and 2200 meters. As a result, a logical segmentation of the 3200 may be 1200-1000-1000. With this kind of segmentation in the race, it is important to get veteran 3200-meter runners into longer repetitions during their pace workouts. Some 3200-meter progressions for elite runners have veterans doing repetitions up to 2000 meters. This length of repetition is developed over several weeks as it is extremely challenging for any young runner to maintain a consistent pace for this duration.

Because the 3200 requires more strength and endurance, this is usually a race for veteran distance runners. Traditionally, freshmen and sophomores have focused more on the 800 and 1600. Juniors and seniors tend to dominate the 3200 at the higher levels of high school competition.

Number of Races in a Single Day

It is highly recommended an athlete be limited to a maximum of two distance races in any one track meet. While a distance runner may occasionally need to triple (run three distance races in one competition) in order to help his or her team win an important competition, this can take a great deal out of the athlete for future competitions. If the philosophy is for a distance runner to have a long and fruitful running career after high school, then tripling should certainly be kept to a minimum. In most countries, it is highly unusual for a distance runner to do more than one race a day.

Over and Under Racing

A widely accepted practice for **distance** runners is to compete in over and under distance races early in the season. Over distance racing helps to build up strength while under distance racing helps to train for speed.

Examples of under or over racing for the 800 would be for an athlete to do a 400 meter and a 1600-meter race early in the season. Likewise, for a 1600-meter specialist, the sequence might include an 800 and a 3200. For the 3200-meter specialist, both the 800 and 1600 might be a good sequence since high school offers very few races longer than 3200 meters and since it takes a little longer to recover from a 5000-meter race if one is available.

Other Keys to Being an Effective Distance Coach

Some simple essentials to remember:

The Athletes Are Not You

You may have been able to do certain workouts or had trouble with certain workouts. Each athlete is an individual. The true artist as a coach takes the time to paint an individual workout plan for each athlete.

Each athlete may respond differently to workouts – one athlete may not have the volume capacity that another has or that the coach anticipates; or one may not be as into distance running as you were as a runner; or one may have stressors outside of track with which you never had to deal.

Quality is Always More Important Than Quantity

No magic workout, no magic number of repeats, and certainly no magic number of miles run can guarantee distance success. For one athlete, less volume and more intensity may bring far more success than more volume.

Coach Your Athletes, Don't Time Your Athletes

While it is important to get accurate times, splits and workout paces on athletes, it is more important to be an observer. Coaches need to be able to recognize when an athlete is working too hard, the workout pace is too easy, the amount of rest interval is not long enough, or an athlete is showing the first signs of an overuse injury.

Over time, vigilant coaches develop the coaching "eye" and notice those special qualities each athlete has. By watching athletes, one can notice changes in stride or technique.

Coach All of Your Athletes

While it may appear to be more rewarding in the public eye to have "fast runners", it is far more important to the development of the program to coach all runners who are willing to give an effort. Many runners who continue on with the sport will continue to get better and better. They may become the next generation of "fast runners." As more runners race and train faster, the quality of all the runners improves greatly.

Have Someone Else Take Splits During a Race

Splits can teach runners a tremendous amount about race tactics and race plans; however, it is better if coaches watch races and workouts rather than having their heads buried in a clipboard recording times.

Teach runners to take splits for teammates and then discuss those splits with the team. Often the splits can help explain good or bad races. Also, uneven splits can expose weaknesses in the training program. They can also show strengths.

Audio Cues During a Race

Keep audio cues during a race or a workout simple and short. Also, keep them as positive as possible. Simple cues such as **"eyes up"** or **"hands past the hips"** allow the racer to focus on just one improvement at a time.

Comments such as **"she's killing you"** probably will not help positively motivate an athlete during a race. Most racers, if properly focused, will hear very little of what is said; consequently, the old **"concentrate"** or **"maintain your focus"** are probably too little too late.

Keep Athletes Healthy

Recommend athletes get a new pair of running shoes prior to each season. Many injuries are directly attributed to shoes that have outlived their safe life span.

Also, error on the side of caution concerning injuries. It is better to miss a couple of workouts or races rather than train through an injury and miss the competitive season. It is far better to be undertrained and healthy than overtrained and injured.

Post-Race Comments

Always give the athlete a little time to digest the race before you meet with him or her. If it wasn't a positive experience, allow them 10 to 15 minutes to be upset with it and then "move on." If it was a great race, allow them 10 to 15 minutes to celebrate and then "move on."

A common practice for a coach/athlete discussion after a race includes talk about what went well and what needs to be improved. Let the athlete talk first. More often than not, the athlete will have accurately assessed the race and already have reached the conclusions you are about to mention.

Have a Purpose for Every Workout and Every Race

A coach should never have an athlete run a race or do a workout unless the coach knows exactly what the purpose of that race or workout is; furthermore, a coach should be able to tell the athlete what the purpose is if the athlete asks.

Races are not workouts and should not be viewed as such. Likewise, workouts are not races and should not be allowed to become competitions.

Self-Worth

Remind athletes their self-worth is not dependent on their racing ability. Remind them no one is a bad person if all the races do not go exactly as planned. Much can be learned from unsuccessful practices and races. Often, coaches get fooled in to a false sense of success by an outstanding race. Great races do not make a great person.

Instill Trust in Runners

In running, it is what runners do when no one is watching that makes all the difference—a runner needs to be intrinsically motivated to do the hard training that must be done during the base training phase; in fact, most of the workouts runners complete are done out of eyesight of the coach.

Perfect Practice Makes Perfect Races

Expect athletes to work for perfection. Practice in general does not make perfect. Constantly demonstrate how to do drills correctly and expect the athletes to do them correctly. Muscle memory is learned regardless of how the athlete does a drill or runs – it can be correct or incorrect. Athletes will be far more successful if all activities are done correctly. Do not be afraid to stop a workout or part of a workout and start it over if it is not being done correctly.

Reward With Exercise

Coaches should reward with exercise rather than punish with exercise. One of the goals of a distance coach is to instill the love of running in his or her athletes. If athletes are "punished" by being made to run, how will they ever learn to love the sport.

Coaches should allow athletes to ask to step up to more challenging workouts rather than requiring them to do more exercise for being late to practice or being disobedient.

Show Your Passion

If the coach is passionate about the sport and honestly shows this to his or her athletes, they will catch the fever. Likewise, if coaches are passionate about their athletes and take an interest in them as human beings, they will probably become more excited about the sport and about the coaching methods.

Help Create the Next Generation of Coaches

Be willing to discuss plans and workouts with athletes. The goal is to educate the athletes well enough so they can eventually coach themselves and continue with the sport for a lifetime. Reward, don't discourage curiosity in athletes. Veterans in the program will educate the younger runners in the program. Give the veterans enough information so they can positively affect those young runners.

Never Think You Have Learned It All

Continue to read, attend clinics, and talk to successful coaches. Don't be afraid to challenge your own beliefs about what works best for your athletes.

Liability and Safety

Distance running is one of the most difficult sports to properly supervise all of the athletes all of the time. With the amount of miles that need to be run, it is almost a necessity athletes leave campus, and with the varying degree or fitness and talent on a high school team, it is almost impossible to keep all athletes together.

Therefore, it is mandatory that all coaches properly explain to all of their athletes the safety precautions that need to be taken when they are working out off campus; furthermore, coaches should repeat these warnings often and document when those discussions were held and who was present.

Here are some precautions for athletes who train off campus:

- Do out and back runs—the entire team goes in one direction on a single road or path and then returns in the same direction—athletes are much closer together throughout the run and there is little chance of runners getting lost.
- There always should be at least two athletes running together. If a group has dwindled down to two runners, those two MUST stay together – NO MATTER WHAT – until they return to campus.
- Run on the left side of the road so you can observe and avoid oncoming traffic.
- Coach should always be in a car or at least on a bike monitoring all runners. Coach should carry a cell phone in case of emergency.
- Stay alert! Athletes should never run wearing a headset. Athletes need to use their eyes and ears to be aware of their surroundings.
- Athletes should not stare at strangers or react to verbal harassment. They should look directly at strangers and be observant, but keep their distance and keep moving.
- Athletes should always obey all traffic laws and never jaywalk.
- Call the police immediately if something inordinately threatening happens to any runner.
- Instruct all runners, especially freshman, they are always to return to school—they must not just go home if they feel tired or injured.
- If one athlete gets injured, his or her partner runner should never leave. The pair should sit and wait on the course or road they were suppose to run for the workout until the coach arrives. If they can walk, they should walk back along the workout path.

2-4 WK PHASE		PRIMARY EMPHASIS	SECONDARY EMPHASIS	MAINTENANCE
Preseason	**1**	**Easy Pace Runs**	**Steady Pace Runs**	
	2	**Steady Pace Runs**	**Tempo Runs**	**Easy Pace Runs**
Early Season	**3**	**Tempo Intervals**	**Reps**	**Steady Pace Runs**
	4	**Reps**	**Tempo Intervals**	**Tempo Runs**
Mid-Season	**5**	**Reps**	**Intervals**	**Easy Pace Runs**
	6	**Intervals**	**Speed Reps**	**Tempo Runs**

SAMPLE 4-WEEK DISTANCE TRAINING PLAN, MARCH 12–APRIL 8

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
12 **Steady Pace Run** 60 min SPR on Sullivan Loop	**13** **Intervals** 2x (200 - 30sec 200 -30sec -200) Jog 800 btwn sets	**14** **Easy Pace Run** 30 min EPR at Vetrans Park	**15** **Race Home League Dual Meet vs Bloom**	**16** **Easy Pace Run** 30 min EPR at Vetrans Park	**17** **Surging** 800m-1000-1200-1000-800 Surge alt 200s	**18** **Easy Pace Run** 30 min EPR on your own or Rest Day
19 **Steady Pace Run** 7m Steady Run at Rollercoaster Loop	**20** **L-Reps** 5 x 800 / 5 min int at increased pace	**21** **Easy Pace Run** 30 min EPR at Water Tower Loop	**22** **Race Away Meet vs Racine**	**23** **Warm-Up** 20 min Easy Warm-Up Run	**24** **Race Glendale Relays**	**25** **Easy Pace Run** 30 min EPR on your own or Rest Day
26 **Steady Pace Run** 60 min SPR at River Loop	**27** **Intervals** 5x(300-60 sec 300) Jog 800 btwn sets	**28** **Easy Pace Run** 30 min EPR at Vetrans Park	**29** **Target Race Home League Dual Meet vs Proviso**	**30** **Easy Pace Run** 30 min EPR at Water Tower Loop	**31** **Surging** 5 x 600 / 4 min int Surge alt 200s	**1** **Easy Pace Run** 30 min EPR on your own or Rest Day
2 **Steady Pace Run** 60 min SPR on Sullivan Loop	**3** **Intervals** (2-4-6-5-3) x 150 w/ jog 50 recovery jog 400 btwn set	**4** **Easy Pace Run** 30 min EPR on campus loop	**5** **Race Away League Dual Meet vs Eisenhower**	**6** **Warm-Up** 20 min Easy Warm-Up Run	**7** **Target Race Thornton Invitational**	**8** **Easy Pace Run** 30 min EPR on your own or Rest Day

PLANNING AIDS FOR DEVELOPING YOUR TRAINING SYSTEM

SAMPLE TRAINING AND COMPETITION PLAN

800 METERS • 1600 METERS • 3200 METERS

Training Break:

(after Cross Country) November 12–December 17
Active rest and cross-training activities.

Training Re-Adaptation Period:

December 18–January 14 (4 weeks)
Resume daily training regimen with long, easy runs.

Basic Preparation Period:

January 15–February 18 (5 weeks)
Increase training mileage, aerobic endurance, and muscular strength. Add surging runs, tempo runs, hill loops, and reps on grass. Begin weight training 2x week.

Transition to Track Training:

February 19–March 11 (3 weeks)
Increase quality and specificity of training with track workouts. Add volume rep sessions on the track on Tuesdays and Saturdays, long runs on Mondays, easy recovery runs on Wednesdays, Fridays, and Sundays.

Competition
Non-League Dual Meets on last 2 Thursdays

Specific Preparation Period:

Phase I March 12–April 8 (4 weeks)
Add speed intervals, surging and long reps at goal pace, and neg-split reps on Tuesdays and open Saturdays. Continue long runs on Mondays and easy recovery runs on Wednesdays, Fridays, and Sundays.

Competition
- 7 League Dual Meets begin on Thursdays
- 2 Invitational Meets on Saturdays

Target Races (2)
- Proviso Dual Meet
- Thornridge Invitational

Specific Preparation Period:

Phase II April 9– April 29 (3 weeks)
Train to race! Add reps faster than goal pace and neg-split reps on Tuesdays, and open Saturdays.

Competition
Final 3 wks of Dual Meets and Invitationals
Target Races (3)
- Oak Park Dual Meet
- Arcadia Invitational
- Mt. Sac Relays

Peak Racing Period:

April 30–June 2 (4 weeks)
Add 15-20 minute tempo runs on Mondays.
Speed reps on Tuesdays.
Easy recovery runs on Wednesdays, Thursdays, and Sundays.

Target Races (3)
- May 4 League Finals
- May 11 CIF Prelims
- May 25 CIF Masters
- June 1–2 State Meet

DISTANCE RUNNERS TRAINING SCRIPT

Sequence Group: Date:

WARM-UP:

Pre-stretch:

STRETCH:

BUILD-UPS:

WORKOUT:

WARM-DOWN:

POWER PLYOMETRIC DRILLS: ❑ Hopping ❑ Bounding

RHYTHMIC PLYOMETRIC DRILLS: ❑ Walking ❑ Skipping ❑ Running

LEG-UPS:

PUSH-UPS:

NOTES:

SAMPLE DISTANCE RUNNERS TRAINING SCRIPT

Sequence Group: 800m / 1600m Date: Mon April 9

1 **WARM-UP:**

Pre-stretch: + 2800m surging last 100m of laps 1-3-5

2 **STRETCH:**

3 **BUILD-UPS:** 6 x 100m

4 **WORKOUT:**

Russian Intervals (300m-jog 100m @:30-300m-jog 100m @ :30-300m)

GROUP 1: x 4@ 48w/jog 800m btw sets; Carlos, Chris C., Marc, Dave K., Vaughan

GROUP 2: x4@ :52 w/jog 800m btw sets; Bob, Pat, Eddie, Wilton, Chris E., Quoc

GROUP 3: x4@ :56 w/jog 800m btw sets; Mark, Robert, Troy, Michele, Chris M., Mary

GROUP 4: x3@ 64 w/walk 400-jog 400 btw sets; Louise L., Gretchen, Annie L., Lesley

5 **WARM-DOWN:** 1000m

6 **POWER PLYOMETRIC DRILLS:** ☑ Hopping ❑ Bounding

2x (8 dbl leg, 4sngl leg)

RHYTHMIC PLYOMETRIC DRILLS: ❑ Walking ❑ Skipping ❑ Running

LEG-UPS:

7 **PUSH-UPS:** 25

NOTES: 7:00 a.m.morning run tomorrow for Groups 1-2-3.
Be here ON TIME!

SAMPLE DISTANCE RUNNERS TRAINING SCRIPT

Sequence Group: 3200m Date: Mon April 9

1 **WARM-UP:**

Pre-stretch: + 2800m surging last 100m of laps 1-3-5

2 **STRETCH:**

3 **BUILD-UPS:** 6 x 100m

4 **WORKOUT:**

Surging: 200m surging alt 300s; 2x1400m surging alt 200s; 1000m surging at 100s

GROUP 1: @ 70-80 / 33-34 / 15-22; Mike T., Dave VH., Dave O

GROUP 2: @ 80-90 / 36-46 / 14-24; Tom, Mike S., Vlady (Grace: 1200-1x1400-1000)

GROUP 3: @ 90-1:45 // 1x1400 @ 42-52 / 1x600 @ 18-25; Margarita, Annie S.,

Meagen, Rose, Alison, Shelley, Janice

5 **WARM-DOWN:** 1000m

6 **POWER PLYOMETRIC DRILLS:** ☑ Hopping ❑ Bounding

2x (8 dbl leg, 4sngl leg)

RHYTHMIC PLYOMETRIC DRILLS: ❑ Walking ❑ Skipping ❑ Running

LEG-UPS:

7 **PUSH-UPS:** 25

NOTES: 7:00 a.m.morning run tomorrow for Groups 1-2-3.

CHAPTER

13

Training Long Jumpers

Success in the long jump depends a great deal on the speed of the jumper because horizontal velocity (speed) is a primary requisite for ultimate success in the event. Great long jumpers such as Carl Lewis, Mike Powell and Marion Jones are also world class sprinters. Just as important as horizontal velocity is vertical impulse and, finally, technique also affects performance.

A Philosophy for Coaching Long Jumpers

High school coaches will find the abilities and physical maturity of young athletes will vary greatly. Long jumpers may range from 14 to 24 foot performers. A coach needs to construct a training program to encompass this spectrum of ability. Training that emphasizes the fundamentals of speed, rhythm and power will benefit jumpers the most. Emphasis on technical execution should increase the performance of all jumpers as they acquire basic jumping skills.

A left-footed takeoff is assumed in all descriptions throughout this chapter on the long jump.

The long jump can be broken down into four phases: 1) the run-up, 2) the takeoff, 3) the flight in the air and 4) the landing.

THE RUN-UP

The dual objective of the run-up is to generate maximum controllable speed at the takeoff board and to be accurate. An accurate and consistent approach run is essential. Habitual fouling or taking off well behind the takeoff board is the result of poor preparation. Sound fundamentals, good sprint mechanics, rhythm and repetition will produce consistent approach runs.

These are important concepts in producing an efficient and precise run-up…

1. Most run-up accuracy errors are caused in the first three to four steps.
2. The last five to six strides in a run-up, when the jumper is in "full flight", should be the most accurate in stride length.
3. The long jump is not a race! The object is to generate maximum speed at the board. The run-up is a controlled acceleration from the start to the takeoff.
4. The length of the run-up is determined by the point at which each jumper can reach maximum controllable velocity. Generally, the faster the runner, the longer the run-up will be.
5. When stride frequency ratios are interrupted by adjusting the stride length in the last five to six strides to "hit the board", horizontal velocity is diminished. Just because the jumper is "on the board" does not mean it is an accurate or good run-up. It is more important to be on the coach's mark five to six strides out from the board.
6. Every jumper has a "posting" leg or a takeoff leg and a "swing" leg or drive leg.

Right-handed athletes generally "post" with the left leg and "swing" the right leg. It is important that long jumpers use the correct leg. A good test for this is to see how a jumper kicks a football. The leg that the long jumper kicks a ball with is the swing leg.

7. Horizontal velocity off the board normally takes priority over height in the long jump.

Establishing a good run-up can be done on the track so that the takeoff board and sand pit do not psychologically affect the stride pattern.

BEATS

Long jump run-ups are measured in "beats.." A "beat" is nothing more than two steps (e.g. each left foot plant). A ten beat run-up, therefore, is twenty strides to the board. Novice jumpers should start at six beats (12 strides), intermediate jumpers eight or nine and good jumpers will need 10 beats or more. The distance of the last four strides, divided by two, allows the jumper to move his or her start marks forward or back a "beat" to shorten or lengthen the run-up (about 13 feet) and still be accurate to the board.

START MARKS

A start mark is placed along the runway where the athlete first begins the run-up. A secondary mark should be at a comfortable three or four steps into the run-up. This secondary mark monitors the place where most run-up accuracy errors occur.

4-5 OR 6 STEP MARKS

This marker is placed four to six steps out from the takeoff board and is not for the jumper—it is for the coach—the athlete should never look for this mark on the runway. In fact, many people refer to this mark as the "the coaches mark," it is the most important mark because being "on" allows the jumper to take even strides to the board without making stride adjustments.

RHYTHM

Like music, the run-up must have a rhythmic quality in order to build up speed and be accurate. Since the final four to six strides are relatively consistent, and the coach can monitor the first three to four steps, the only problem is getting from the start marks to the coach's mark. This can be accomplished by adopting a three step rhythm. The jumper needs to "hear" this galloping rhythm and be able to repeat it.

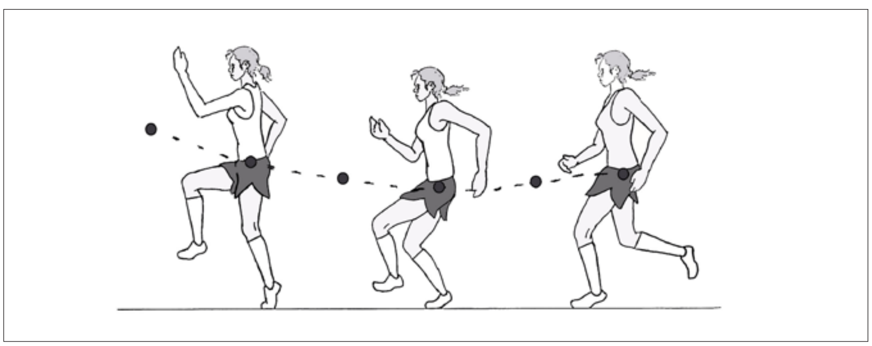
THE TAKEOFF

The long jump takeoff entails lowering the center of mass slightly on the penultimate step (next to last step) and driving the left arm and free leg upward to apply extra force to the board thus creating lift and some vertical velocity. This should have a “ba-boom” sound to it.

Long jumpers should not look at the takeoff board during the run-up or at takeoff but should keep the eyes focused on a spot behind and above the pit. The jumper should also not throw the head back on takeoff. Applying too much upward movement diminishes the horizontal velocity off the board.

In a run-up, as in sprinting, the ground contact for each step is about .07 to .08 seconds. During the takeoff, the center of mass keeps moving while the foot is in contact (.11-.12 seconds) with the takeoff board. This creates a “hinge moment” (also called checking linear motion) resulting in a forward somersaulting action.

Where the center of mass is in relationship to the foot when it breaks contact with the board makes up part of the length of the jump. The center of mass should be well forward of the foot. Some coaches believe it is not necessary to “coach” a lowering of the center of mass on the penultimate step-they feel this will occur naturally. A shorter last stride does help to get height in the jump, but it somewhat diminishes horizontal velocity.

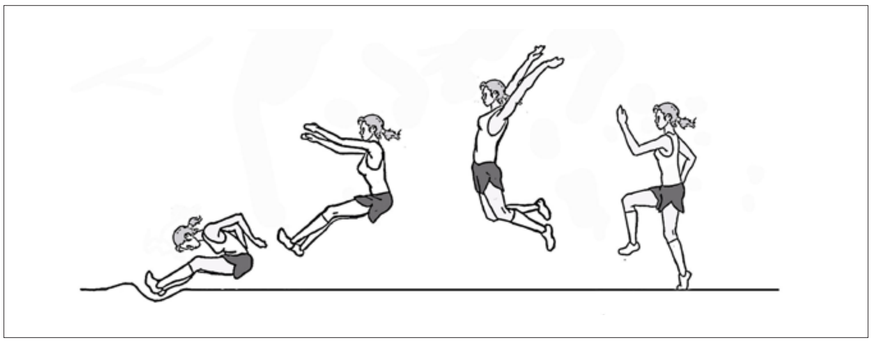


THE FLIGHT

There are two basic techniques for flight in the air and each has the purpose of counteracting the forward somersaulting action created in the takeoff, so the jumper arrives in the sand in a good efficient landing position. Once the foot breaks contact with the board, the center of mass travels on a perfect parabolic curve to the landing; it can’t be changed in the air but body position around it can be adjusted.

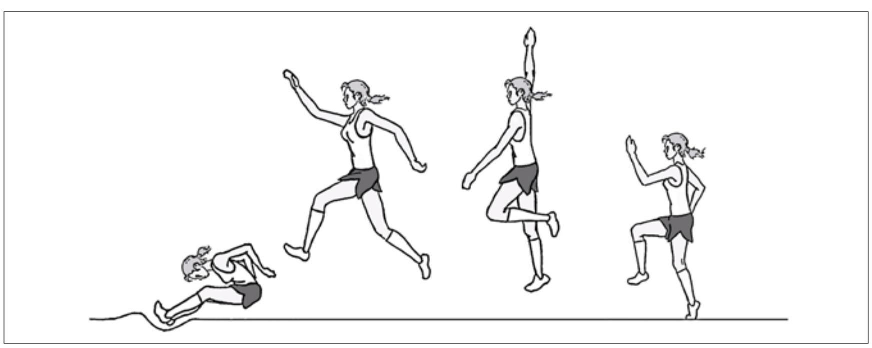
THE HANG

In the "hang" style of jumping, the somersaulting action is slowed by extending the arms and legs as far away from the center of mass as possible, thereby, slowing the forward rotation. The jumper will be in an inverted "C" position. The arms then are moved forward and down, lifting the legs in an action reaction movement. This style of flight is probably best for novice jumpers because it is easier to teach and quite effective; in fact, it is used by many world class jumpers.



THE HITCH KICK OR RUN IN THE AIR

In this movement in the air the arms are rotated in the direction of the forward rotation which creates an opposite reaction to the trunk, moving the hips forward. The left arm, driving up on takeoff, will reverse itself and rotate 540-degrees finishing behind the body. The right arm will rotate 360-degrees and also will finish aligned with the left arm behind the body. The legs continue the running motion in the air and contribute to counteracting the forward rotation by moving forward from the hip with a short radius and back with a long one.



THE LANDING

An efficient landing is critical to the length of the long jump. The object is to "break" the sand as far forward as possible with the heels, using straight legs, then move the rest of the body even or passed that mark.

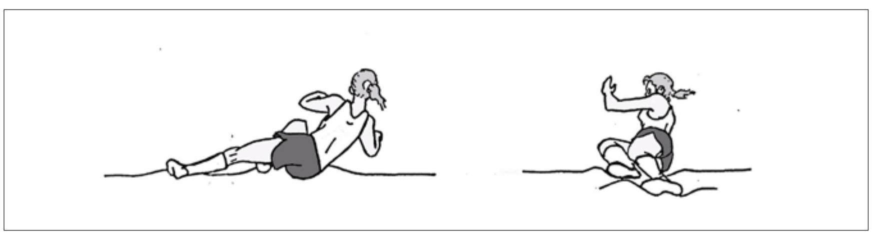
There are three basic landing techniques: "buttocks in the hole," "skid out" and "over the top."

BUTTOCKS IN THE HOLE

In this landing technique, the legs are extended at about, or slightly above, the path of the center of mass. The feet blow a hole in the sand and continue forward, bending at the knees while the buttocks are lifted by slightly arching the back, eventually dropping into the hole. Where the buttocks land and where the feet break the sand should be the same. The arms should be back on initial contact and then brought forward.

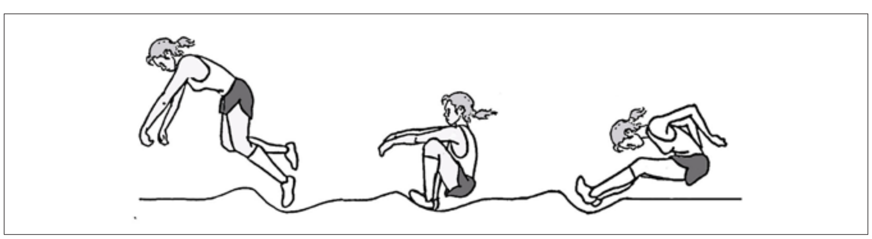
SKID OUT

In this landing, the left leg is extended out to the left and the body leans to the right. The left leg blows a hole, the right leg collapses and the right hip lands even to the right of the initial contact hole of the left leg. The arms are brought forward on contact.



OVER THE TOP

This landing is similar to the "buttocks in the hole." Both legs collapse and the buttocks are brought to the heels. The arms are then moved forward and the body rotates forward.



Coaching Tips

1. Working on the track instead of the runway…

A) Establish a three- or four-step mark with tape and make sure this mark is "on."

B) Do two sets of six run-throughs (with a break in between) and mark each coach's mark (4-6 strides out from the board) and takeoff mark with small pieces of tape.

As a "pattern" begins to emerge, remove the pieces of tape that are exceptionally long or short (called erratics). Do this for several days until you have a good "pattern."

2. Measure these marks and then transfer them to the long jump runway and begin to practice the run-up.

3. Emphasize a three-step rhythm during the run-up.

4. Establish a competition warm-up routine and continue to work to the coach's mark.

5. Use a four-inch "lift box" to practice flights in the air and landing from short run-ups.

6. During competition, coaches should adjust the start marks of their jumpers to compensate for wind, different surfaces, nervousness or the athletes' fitness to make sure the jumpers land exactly on the coach's mark.

Do not adjust marks back from the takeoff board. The final four to six strides must be the most consistent and any change in stride length in an attempt to be "on" the takeoff board will diminish horizontal velocity.

7. Athletes should never do pre-meet warm-ups from the takeoff board backwards up the runway to check their approach. Runways are always placed to take advantage of a tailwind, so "checking" a step into the wind will never be correct when the jumper turns around and comes back down the runway with the tailwind.

Drills

Practicing the long jump is difficult to do in a sand pit that is not properly maintained and prepared daily for practice or meets. While jumping in practice or in competition, make sure the sand in the pit has been dug up and turned over several times and is watered down.

A good drill to practice without using a sand pit is to jump off a lift box with a short run, practice the flight and land in a foam pit borrowed from the high jump or pole vault events.

Another drill that can be used is the "standing long jump drill." Stand tall in a sprint position, drive the free leg up with the left arm, drop the free leg and elevate the arms, arch back into a reverse "C", pull down with arms and touch chest to thighs.

THE "LIFT" BOX

A four-inch lift box can be purchased commercially (they are called step aerobics boxes) or they can be easily constructed using a 2' X 2' piece of 1/2 inch plywood and a 2" X 4" stud. Cut the 2" X 4" into a frame and screw or nail it to the plywood. This lift box can also be used in the triple jump, pole vault and high jump.

Training for the Long Jump

As with every other event, universal principles of training apply to the long jump.

PROGRESSIVE OVERLOAD

In order for the physical capacity of the athlete to increase, the athlete's system must be subjected to stress, or overload. The body's adaptation to this stress results in increased capacity. This cycle of stress and adaptation is the foundation of all training. As discussed in a previous chapter, this is also known as the **SAID** principle, the Specific Adaptation to Imposed Demands.

SPECIFICITY

The body adapts to specific demands placed upon it; therefore, training for the long jump must specifically address the requirements, strengths, and skills needed to perform these events.

REPETITION

This principle is an outgrowth of the specificity requirements. In a technical event such as the long jump, the neuromuscular patterns of technique need to be enforced through repetition of movement. This usually entails dissecting the jump into components and performing them repeatedly with proper technique.

RECOVERY

In order for the body to adapt to progressive overload, it must rest and recover from the applied stress. Long jumpers need ample recovery for their legs to be fresh. Since much of the training they must do is quite demanding, long jumpers require plentiful rest even though they may not feel tired or worn out. Long jumpers cannot jump every day and expect to perform well in competition.

Explosiveness and Acceleration

Long jumps are explosions of the body off the ground. The body becomes a projectile accelerated by its own power. The training of a long jumper needs to specifically develop this explosiveness through weight training, plyometric training, and jumping.

Body Control (Kinesthetic Awareness)

To excel in the long jump, the athlete must develop the ability to control the position and posture of his or her body while in motion, both on the ground and in the air. The athlete needs to have a feel for the body and how it moves. This is the essence of athletics. Drills and repetition refine this awareness.

Considerations in Training

Both the coach and the athlete must have an understanding of the physical and technical skills needed to be a successful long jumper. This means understanding the importance of sprint speed and mechanics, leg strength, jumping power, rhythm, flexibility and proper jumping technique.

- Athletes should also have a basic understanding of the biomechanical principles that govern their event. With effort by the coach, these can be taught easily. Most important, jumpers need to understand the importance of the transfer of horizontal velocity into the jump.
- Developing sprint speed and mechanics are the most important features of training for the long jump. Long jumpers must train to be short sprinters.
- Successful long jumping requires good strength. The transition from approach to takeoff in the long jump is one of the most physically difficult skills in track and field. Preseason weight training and intelligent use of plyometric training throughout the season will help provide athletes with the strength they need to perform well and avoid injury.

- Good jumpers must also be flexible. The speed and power demands of the long jump place athletes with poor flexibility at substantial risk of injury. Long jumpers should include event specific stretching exercises into their daily workouts.

Since good long jumpers and triple jumpers are usually good sprinters, these athletes often compete in multiple events. It is the responsibility of coaches to adjust the training of jumpers to ensure they have adequate rest and recovery. Hard jumping or sprinting cannot be done every day.

Types of Training for the Long Jump

The types of training done for the long jump can be divided into three categories: general training, specific training and specialized training.

General training develops the overall physical capacity and fitness of the athlete. This encompasses basic running, weight training, plyometric exercise and rhythm development.

Specific training has a direct correlation to the skills necessary for long jumping. Often it is a refinement of general training. Sprinting, sprint technique drills, jumping technique drills and specific plyometric drills are included.

Specialized training duplicates the exact movements of long jumping. This normally involves exercises that replicate a specific feature or phase of the jump. Full speed approach runs, full jumps, transition drills with takeoff and multiple jumps are examples.

With high school athletes, the vast majority of training will be general in nature. First, the strength and performance levels of these young long jumpers will benefit much more from general training throughout most of the season. Coaches should develop jumpers as athletes first, then as long jumpers. Second, with a large number of athletes to guide, few coaches can spend the time necessary for intensive specialized training. Third, most jumpers are multi-event athletes, and general training fulfills the basic training demands of other events as well.

Specific and specialized training teach athletes to be good long jumpers. The proportion of specific and specialized training to general training should increase over the course of the season. Specialized training is the refinement of technique. At the high school level, it should account for only a modest amount of the total training program.

Like any event in track and field, the long jump requires many types of training…

- Running training (including sprinting)
- Plyometric training (including rhythm jumping drills)
- Weight training
- Technique drills
- Long jumping
- Flexibility training
- Jump testing

Running Training

Running workouts for long jumpers develop overall fitness, endurance, rhythm, sound running mechanics, and especially sprint speed. Emphasis should be placed upon building speed and developing a strong acceleration pattern with relaxed sprinting technique. Off-season long runs will strengthen the athlete and prevent injury. In-season training should include sprint training twice per week. Of course, the multi-event athlete also needs to train for his or her specific running event. This usually satisfies the general fitness demands of long jumping.

Sample Running Workouts

- Off-season: Easy distance runs (2-3 miles)
- Preseason: Long sprint repetitions (400-600 meters)
- All season: Short sprint repetitions (50-300 meters)
- Late season: Fast sprint repetitions
    - 30-60m from blocks or with a flying start
    - 50-70m at run-up rhythm
    - l0-15m with a flying start

Plyometric Training

Plyometric training specifically fulfills the needs of long jumpers by developing the ballistic muscular strength these events demand. Care must be taken not to over train and risk injury. Nonetheless, plyometrics are effective because they directly address several principles of training for the long jump.

Sample Plyometric Workouts
• Rhythm plyometric drills (rhythm skipping and bounding)

• Easy multiple jumps (R-R-LL-R-R--LL-RR or L-R-L-R-L-R)

• Power skipping and bounding

• Hurdle hops

• Rhythm run-ups into a long jump

Weight Training

Weight training builds basic strength. The off-season is the time for long jumpers to work in the weight room. After the competitive season begins, weight training should become a maintenance activity.

Many long jumpers probably come to track and field directly from another seasonal sport, so they may not have time to undertake a full strength training program.

Sample Weight Training Exercises…
• Half-squats (4 x 10 @ 60% SRM* or 5 x 3 @ 90% SRM)

• Leg extensions

• Hamstring curls

• Step-ups or lunges

• Snatches or cleans

(SRM = single rep maximum)

Sample Jump Technique Drills
• Rhythm plyometric jumping (skips, bounds, multiple jumps)

• Rhythm high knees

• Standing long jumps (stressing positions and extension)

• Approach runs with a simulated takeoff (pop-off)

• Pop-offs (ups) (stressing rhythm and mechanics of transition)

• Hanging drills (simulate run-up and jump while hanging from bar)

To train specifically, athletes must *long jump* in practice. Full approach jumps are physically quite demanding and should not be overdone in training. Long jumping sessions should address the aspects of technique, endurance and maximum effort. Each session should emphasize a single aspect of the jump.

Important Note: Many coaches have their athletes long jump over hurdles as a means of increasing the height of the jump. This can be a disastrous training exercise. It develops improper biomechanics, leads to bad technical habits and increases the risk of injury to the athlete. Few, if any athletes can execute a jump properly with enough height to clear a hurdle. More likely, the jumper will learn to slow at the end of the approach to gather for the takeoff, then pull the legs up into a poor jumping position in order to clear the hurdle. Moreover, this drill uses the negative incentive of fear (hitting the hurdle) as motivation.

Endurance Jumps

By performing 6-10 jumps using good technique and rhythm, endurance jumps build specific jumping fitness and reinforce the need for consistency. Once again, the objective is to stress execution, not distance.

Maximum Effort Jumps

These specialized jumps emphasize effort and performance. After a thorough warm-up, the athlete should take three to six full approach jumps. More jumps may be taken with a shorter approach. Maximum effort jumps should be done once every two weeks early in the season and once a week with fewer jumps as the season progresses. A high school jumper who is competing in a dual or invitational meet every two to four days throughout the season may never need to do this type of training. Jumping far is for meets; jumping correctly is for practice.

Jump Testing

Although the real test of an athlete's progress in training is performance in competition, coaches should test the physical skills of their athletes periodically. This helps to identify individual strengths and weaknesses, while encouraging and motivating athletes as well. Test three to four times during the school year if possible, or perhaps twice during the season. Testing at the end of the season will provide both the coach and the returning jumpers with training goals for the next year.

Sample long jump test (two attempts each test)

- 50m sprint for time
- SRM Half-squat
- Vertical jump
- Hamstring curls for maximum reps
- Standing long jump
- 30m flying sprint
- 10 Bounds for distance
- Multiple jumps (e.g. H-FI-S--FI--H-S)

A Reminder About Rest

Many coaches and athletes fail to understand that rest and recovery are essential parts of the training process. "No pain, no gain" can only accomplish so much. Sore and exhausted muscles cannot perform up to their capacity. Sometimes it may be necessary to train *through* a meet; however, especially for jumpers, nothing improves performance more than rest.

Training for the High School Season

Periodizing training is dividing the season into a cycle of several phases, each emphasizing particular types of training and skill development during a specific period of time. Other types of training are not neglected, but are less emphasized during that period. The components that make up training for a skill event are numerous and complex. As a rule, three to four weeks seems to be the maximum period during which athletes can sustain improvement with any one type of training.

During a two to four week training phase, primary emphasis should be given to one type of training, secondary emphasis should be given to another type of training, and a somewhat less emphasis (maintenance training) to another. Within any training phase it is not wise to include more than three quality days per week, including competitions. The remaining days should be easy training and recovery days.

Training is stress. When constructing an athlete's training regimen, coaches should plan how they are going to introduce and manage that stress. Recovery is an essential component of all types of training because all improvement occurs during recovery while the body adapts to the stress. The long term consequences of the coach or athlete not planning for recovery or an athlete not listening to his or her body are illness, injury, overtraining, and burn-out.

	WEEKS	PRIMARY EMPHASIS	SECONDARY EMPHASIS	MAINTENANCE
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	3	**Rhythm plyos**	**Technique**	**Easy runs**
Early Season	**3**	**Power plyos**	**Sprint reps**	**Technique**
	3	**Tech jumps**	**Specific plyos**	**Sprint reps**
Mid-Season	**2**	**Tech drills/jumps**	**Specific plyos**	**EP runs**
	2	**Intervals**	**Tech drills**	**Specific plyos**
Late Season	**2-4**	**Special training**	**Technique**	**Sprint reps**
		Tech jumps		

SAMPLE 4-WEEK HORIZONTAL JUMPS TRAINING PLAN, APRIL 1–28

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22 **Rhythm Drills** 8 x 50m **Block Starts** **Power Skipping** **Hurdle Hops** **3 x LL–RR–LL–RR**	**23** **Easy R-Drills** **Sprint Drills** **45 x 80 Strides**	**24** **LJ Tech Drills** **TJ Tech Drills** **4 x 120 Tempo**	**25** **Team Meeting** Warm-Up Stretch **5 x LJ Approach**	**26** **Away Meet** **vs** **Toomey HS**	**27** **Rest Day!**	**28** Easy Run or Rest Day

PLANNING AIDS FOR DEVELOPING YOUR TRAINING SYSTEM

LONG/TRIPLE JUMPERS' WORKOUT

Sequence Date:

RUNNING WARM-UP:
Pre-stretch plus:

RHYTHM AND SPEED POLYOMETRIC DRILLS:

LONG/TRIPLE JUMP TECHNIQUE: Drills and Jumps

POWER PLYOMETRIC DRILLS:
❑ Skipping ❑ Hopping
❑ Bounding ❑ Multiple Jumps

RUNNING AND APPROACH DRILLS:

WARM-DOWN:

WEIGHT TRAINING:

NOTES:

SAMPLE LONG/TRIPLE JUMPERS' WORKOUT

Sequence Date: Mon April 9

1 **RUNNING WARM-UP:**
Pre-stretch plus: jog 1600m

2 **RHYTHM AND SPEED POLYOMETRIC DRILLS:** in training flats

3 **LONG/TRIPLE JUMP TECHNIQUE:** Drills and Jumps in spikes on runway
*3-5 approach *3-5 box takeoff and landings
*2x3-step pop-ups *2x 3-step jumps

4 **POWER PLYOMETRIC DRILLS:**
❑ Skipping ❑ Hopping
☑ Bounding ❑ Multiple Jumps
2-step combos: 4-5x RRL/LLR on grass in training flats (step comes at 35% HOP-30% step-35% Jump)

5 **RUNNING AND APPROACH DRILLS:** in spikes
2x300m @ 60% - 3x200m @ 70% - 4x100m @ 80% - 2x50m @ 90%

6 **WARM-DOWN:** jog 800m

7 **WEIGHT TRAINING:** Phase / Speed/Strength Series

NOTES:

CHAPTER

14

Training Triple Jumpers

There certainly is a parallel between watching a flat stone skip across the top of a calm lake and a triple jumper gliding across the runway after hitting the takeoff board. To successfully skip a stone over water, the stone must hit the top of the lake at a flat angle and have sufficient velocity to do multiple skips. The same type of technique is necessary in the triple jump. Unlike the long jump, in which the jumper is striving for vertical lift off the board, the triple jumper is trying to "run off the board", and it is imperative that no forward rotation be generated at that time. The difference in the takeoff of the long and triple jump makes coaching this event and doubling these events difficult. Most world class triple jumpers do not long jump! Maintaining horizontal velocity throughout the three phases of the jump is the key to good triple jumping. Throughout the three phases, the eye focus should be beyond the pit on a distant object (never looking down). Good technique in the triple jump will result in positive performances.

A Philosophy for Coaching the Triple Jump

The coach should realize the triple jump is an event that cannot be practiced in all phases very often. High jumpers, pole vaulters, throwers and hurdlers may be able to execute their events multiple times in practice; however, the triple jump is so stressful on the body when performed at “full speed” that the event must be broken down into practice segments and then put together in competition to avoid injury and fatigue.

Various drills make up most of the technique practice in the triple jump.

High school coaches will find the abilities and physical maturity of young athletes varies greatly. Triple jumpers may range from 24- to 50-foot performers. A coach needs to construct a training program to encompass this spectrum of ability. Training that emphasizes the fundamentals of speed, rhythm, and power will benefit jumpers most. Emphasis on technical execution should increase as athletes acquire basic triple jumping skills.

Finally, an *accurate and consistent approach run is essential* in the triple jump. Habitual fouling or being well behind the board at takeoff is the result of poor preparation. Sound fundamentals, rhythm, and repetition will produce consistent approach runs. Fouling is simply a waste of good effort.

The Run-Up

The run-up in the triple jump is basically the same as the long jump (see the previous chapter on establishing and coaching the run-up). Although horizontal velocity is very important in the triple jump, the run-up in the triple jump has to be more controlled than that in the long jump.

Phase 1 The Hop

The takeoff is the most critical component of a good triple jump. The jumper cannot elevate off the board as is done in the long jump. A single arm (running type) takeoff is recommended.

A double arm takeoff where the right arm is held back on the penultimate stride and then both arms come together on takeoff diminishes horizontal velocity because the center of mass is behind the foot creating forward rotation, most likely resulting in a hop that is too high.

The “lift” off the board is very mild in the triple jump and there is very little drop of the center of mass in the penultimate stride.

There are other types of takeoffs that allow the jumper to land during the hop with both arms back.

In the “arm and a half” technique, the left arm drives forward and the right arm is moving backward but “bounces” off the stomach and is thrust forward. Both arms come back together during the hop flight.

Another method, used by world record holder, Jonathan Edwards, is called the “loop.” In this technique, the right arm, moving backwards at takeoff, continues to rotate around the shoulder in a 360-degree circle, meeting the left arm and landing both arms back.

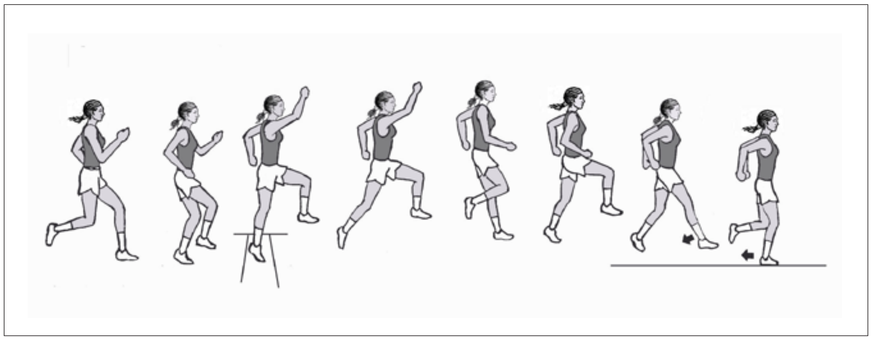
As the athlete leaves the board, the takeoff leg is extended for a complete push off the ground. The drive leg thigh should be below parallel to the ground at takeoff with the knee joint at 45-degrees.

The drive leg will then begin to rotate from in front of the center of mass to behind it, while the takeoff leg begins to pull forward. As the takeoff leg reaches parallel, the lower portion of that leg extends past the knee, with the foot dorsiflexed. Once the leg is extended, the athlete then forcefully drives the entire leg downward, **striking** the ground and setting up an active flat-footed landing.

A unique feature of the triple jump is the action of the landing foot at the end of each phase. A **pawing** motion of the foot creates a backward velocity of the landing leg, helping to maintain forward velocity of the body.

The hop phase of the triple jump begins with a run off the board, run in the air and land on the same foot as the takeoff. Throughout this phase the upper body must remain in a vertical position (no leaning forward or back). The jumper must land with the center of mass over the foot and the free leg and arm or arms behind the body, so they can swing forward and lift the jumper into the second phase.

“Reaching” for the landing with the center of mass behind the foot “checks” horizontal velocity into the second phase and causes forward rotation. Excessive height on the hop will hinder the jump because the increased absorption time upon landing reduces horizontal speed and will lessen the distance of the step. The hop phase should **never** make up more that 35 percent of the total jump distance.

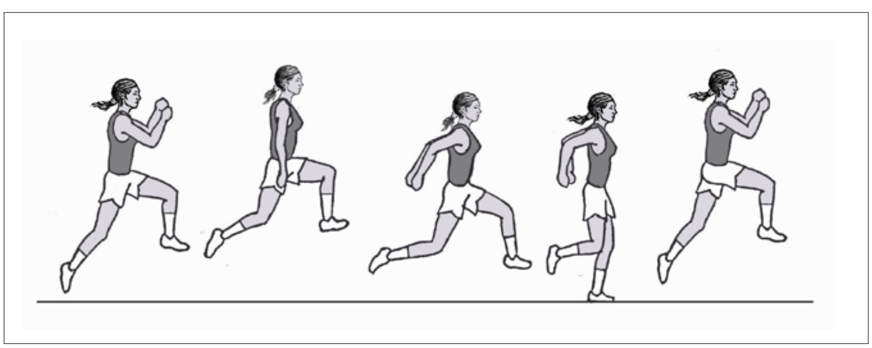


There is a saying that “the triple jump starts at the end of the hop.”

Phase 2 The Step

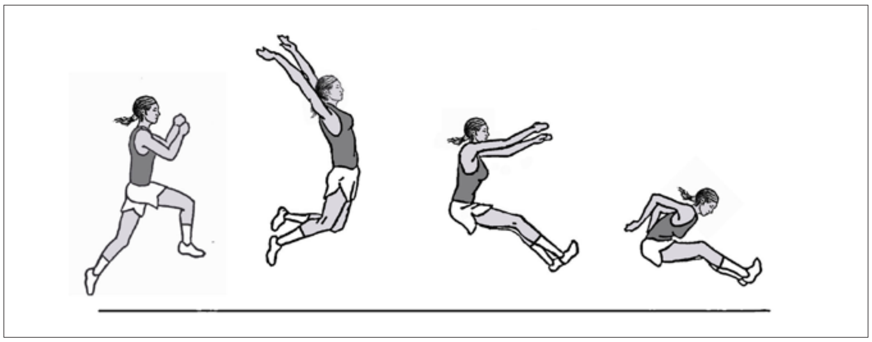
The second phase of the triple jump begins as the takeoff foot returns to the ground. The takeoff leg is fully extended with the drive leg parallel to the ground and the knee at 90-degrees.

As the athlete leaves the ground, the takeoff leg stays behind the center of mass and the drive leg “holds” parallel to the ground, 90-degrees at the knee position. As the athlete begins the descent, the drive leg drops downward for a quick transition to the jump phase. Once again the center of mass should be over the foot (not behind or in front). The step phase should make up 30 percent of the total jump distance.



Phase 3 The Jump

The third and final phase of the triple jump is basically a long jump preceded by a jump rather than a run. The takeoff leg (the drive leg in previous phases) is extended forcefully upon contact with the ground. A “hang” style is used (see the long jump chapter) in which the arms are driven up and the drive leg is dropped and the body assumes an inverted “C" position. The arms are brought forward and the legs are straightened. The best landing would be a “buttocks in the hole” as detailed in the long jump chapter. The jump should make up 35 percent of the total jump length.



Ratios

Ratios of the hop, step and jump are very important. As previously mentioned, the hop should make up no more than 35 percent of the total jump. Long hops create short steps and jumps with diminished horizontal velocity. Triple jumping involves getting three long jumps, not one long and one or two short ones. The key is getting a "step” that is 30 percent of the jump.

If a jumper is capable of triple jumping 40-feet, as an example, the jump would consist of a 14-foot hop, a 12-foot step and a 14-foot jump which equals 40 feet! The training of this athlete would be to execute these distances in drills and practice. When the jumper is jumping 40 feet, you then move to a 41- or 42-foot ratio! It is a good idea to place markers at each of these distances and film them in competition.
Use the following chart to work with your triple jumpers.

TRIPLE JUMP RATIOS			
RATIOS	**HOP**	**STEP**	**JUMP**
30'	10-6	9-0	10-6
31'	10-9	0-4	10-9
32'	11-2	9-8	11-2
33'	11-7	9-10	11-7
34'	11-10	10-3	11-10
35'	12-3	10-6	12-3
36'	12-8	10-8	12-8
37'	13-0	11-0	13-0
38'	13-4	11-4	13-4
39'	13-8	11-8	13-8
40'	14-0	12-0	14-0
41'	14-4	12-4	14-4
42'	14-8	12-8	14-8

THE WORLDS LONGEST TRIPLE JUMP

Jonathon Edwards of Great Britain holds the world record in the triple jump at 60'. Edwards started jumping as a 14-year-old, and 20 years later he set the world record. He also had a 60' 5" wind aided jump that was very close to the perfect 35-30-35 ratio.

Teaching the Triple Jump to Beginners

For athletes who are being introduced to the triple jump it is best to start out with the basic movements of the hop, then step, then jump from a standing start. Most triple jumpers use their "posting" leg for the hop since they are taking off and landing on it. For people who are right handed this is normally the left leg. The jumper should concentrate on an even rhythm for each flat-footed landing.

Next, the jump should be broken down into its component phases. This would start with the hop by doing a walking one-legged hop several times. Then, the circling action of the hop leg should be incorporated. Then, multiple one-legged hops with a circling leg, flat landing and upright posture should be attempted.

After learning the hop, the beginning jumper should move on to the step and jump phases. Consecutive bounds duplicating the step and jump actions should be done. The distance of each bound should be approximately equal to one another. Cones placed equally apart will help to monitor this.

Next, the jumpers should combine the three phases of the triple jump. They should start with the hop and step combinations on grass. Coaches should stress carrying the momentum from the hop into the step. Finally, the jump phase is added to the end. Once the phases have been put together, coaches should slowly add steps to the run-up in accordance with the athletes' ability to control their speed properly.

THE FOOTSRIKE TROUGH THE THREE PHASES

The transitions from hop to step and step to jump are of the utmost importance in maintaining the greatest velocity during each phase of the triple jump. This active landing, referred to as pawing, is similar to the foot strike of a tiger, reaching out, grabbing the ground, and pulling it towards the body.

In an active landing, the athlete's leg is extended, the ankle flexed and the entire lever (leg and foot) pulled down, forcefully striking the ground mid-foot. Upon contact with the ground, the body rolls forward over the foot onto the toes while pushing off the ground. If the athlete lands stiffly on the heel, a braking action will occur, decreasing velocity and distance and increasing the chance of injury.

Considerations in Training

Both the coach and the athlete must have an understanding of the physical and technical skills needed to be a successful triple jumper. This means understanding the importance of sprint speed and mechanics, leg strength, jumping power, rhythm, flexibility and proper jumping technique.

- Athletes should also have a basic understanding of the biomechanical principles that govern their event. With effort by the coach, these can be easily taught. Most importantly, jumpers need to understand the importance of the transfer of horizontal velocity into the jump.

- Developing sprint speed and mechanics is the most important feature of training for the triple jump. Triple jumpers must train to be short sprinters.

- Successful triple jumpers require good strength. The triple jump requires substantial strength. Preseason weight training and intelligent use of plyometric training throughout the season will help provide athletes with the strength they need to perform well and avoid injury.

  Good jumpers must also be flexible. The speed and power demands of the triple jump place athletes with poor flexibility at substantial risk of injury. Triple jumpers should include event specific stretching exercises into their daily workouts. Flexibility is especially crucial to success in the triple jump.

- All jumpers need to develop sound rhythm and jumping coordination. Building good rhythm skills along with speed is the key to producing solid triple jumpers. Rhythm drills should be an integral component of any training.

- Since triple jumpers are usually good sprinters, these athletes often compete in multiple events. It is the responsibility of coaches to adjust the training of jumpers to ensure they have adequate rest and recovery. Hard jumping or sprinting cannot be done every day. If a team has a separate jump coach and sprint coach, these two coaches must work closely together to plan a jumper's training.

Developing Jumping Rhythm

Rhythm is essential to successful jumping. It provides a structure for the expression of speed and power throughout the run-up and jump. Rhythm establishes the timing and cadence of explosiveness in jumping. The learning of rhythmic skills is fundamental for all young jumpers. For young athletes, rhythm skills can compensate for the lack of power in executing a triple jump. The development of jumping rhythm is enhanced by various types of training, most specifically plyometric drills and approach run repetitions. With the triple jump, the fluid transition from phase to phase with an even cadence must be stressed.

Types of Training for the Triple Jump

The types of training done for the triple jump can be divided into three categories: **general training, specific training, and specialized training.**

General training develops the overall physical capacity and fitness of the athlete. This encompasses basic running, weight training, plyometric exercise and rhythm development.

Specific training has a direct correlation to the skills necessary for triple jumping. Often, this encompasses a refinement of general training. Sprinting, sprint technique drills, jumping technique drills and specific plyometric drills are included.

Specialized training duplicates the exact movements of triple jumping. This routinely involves exercises that replicate a specific feature or phase of the jump. Full-speed approach runs, full jumps, transition drills with takeoff and multiple jumps are examples.

With high school athletes, the vast majority of training will be general in nature. First, the strength and performance levels of these young jumpers will benefit much more from general training throughout the majority of the season. Coaches should develop their jumpers as athletes first, then as triple jumpers. Second, with a large number of athletes to guide, few coaches can spend the time necessary for intensive specialized training. Third, most jumpers are multi-event athletes. General training fulfills the basic training demands of other events as well.

Specific and specialized training teaches athletes to be triple jumpers. The proportion of specific and specialized training to general training should increase over the course of the season. Specialized training is the refinement of technique. At the high school level, it should account for only a modest amount of the total training program.

As with any event in track and field, the triple jump requires many types of training:

- Running training (including sprinting)
- Plyometric training (including rhythm jumping drills)
- Weight training
- Technique drills
- Triple jumping
- Flexibility training
- Jump testing

Running Training

Running workouts for triple jumpers develop overall fitness, endurance, rhythm, sound running mechanics and especially sprint speed. Emphasis should be placed upon building speed and developing a strong acceleration pattern with relaxed sprinting technique. Off-season long runs strengthen the athlete and prevent injury. In-season training should include sprint training twice per week. Of course, the multi-event athlete also needs to train for his or her specific running event. This usually satisfies the general fitness demands of triple jumping.

Sample Running Workouts

• Off-season: easy distance runs (2-3 miles)

• Preseason: long sprint repetitions (400-600 meters)

• All season: short sprint repetitions (50-300 meters)

• Late season: fast sprint repetitions

30-60M from blocks or with a flying start

50-70M at run-up rhythm

10-15M with a flying start

Plyometric Training

Plyometric training specifically fulfills the needs of triple jumpers by developing the ballistic muscular strength these events demand. Care must be taken not to over train and risk injury. Nonetheless, plyometrics are effective because they directly address several principles of training for the triple jump and duplicate many of the event's movements.

Sample Plyometric Workouts

• Rhythm plyometric drills (rhythm skipping and bounding)

• Easy multiple jumps (R-R-L--R-R-L-R or L-R-L-R-L)

• Power skipping and bounding

• Hurdle hops

• Rhythm run-ups into triple jump

Weight Training

Weight training builds basic strength. The off-season is the time for jumpers to work in the weight room. After the competitive season begins, weight training should become a maintenance activity. Many triple jumpers probably come to track and field directly from another seasonal sport, so they may not have time to undertake a full strength training program.

Sample Weight Training Exercises

• Half squats (4 x 10 @ 60% SRM* or 5 x 3 @ 90% SRM)

• Leg extensions

• Hamstring curls

• Step ups or lunges

• Snatches or cleans

(*SRM=single rep maximum)

Technique Drills

As previously stated, triple jump drills make up the greatest amount of triple jump technique work. Several of these drills can make up a workout session.

• Standing five step (alternating bounds)

• Running five step

• Standing triple jump

• 2-4-6-8- Stride triple jump

• Hop-ratio drill (working on getting the right hop distance)

• Step-jump ratio drill (working on getting the right step and jump distance)

• Hop-step ratio (doing just the first two phases without a jump)

• Box hop drill... This drill uses the 4" box half way between the takeoff and landing. The jumper takes off with the left, steps on the box with the right, and then lands on the left. It teaches the jumper to run off the takeoff, have low trajectory and carry good speed into the step.

• Takeoff drills

BOUNDING

Beginning jumpers need to learn how to bound. Bounding involves high knees and vigorous arm action. It is best to start bounding between cones about five to six feet apart. These bounding drills are done with a ten yard run-up on the grass. The total distance of the bounds can vary from 10 to 50 yards depending on the fitness of the athletes. When the knees stop coming up with the thighs parallel to the ground it's time to stop!

- Alternating bounds - power bounding
- LL-RR-LL-RR-LL-RR-LL-RR
- LL-R-LL-R-LL-R-LL-R-LL-R
- Skip drills (this a good warm-up)

Jump Testing

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8 **5x80 Tempo BUs** **Power Series:** Skipping / Hopping Standing TJs Multiple Jumps 120-140 Contact	**9** **TJ Technique** 8 x S-Approach Jumps **Hurdle Hops** **1 x 400 Stride**	**10** **Team Meeting** Warm-Up Stretch **5 S-Approach LJs**	**11** **Away Meet** **vs** **Campbell HS**	**12** **Sprint drills** **TJ Tech Drills** **Rhythm Jumps**	**13** **Block Starts** 6 x 60 **Power Plyos** **6x30 Tempo BUs**	**14** Easy Run or Rest Day
15 **5x LJ Run-ups** **5 S-Appro TJs** **Power Series:** Skipping / Hopping Standing TJs	**16** **LJ Tech Drills** **TJ Tech Drills** **Sprint Workout** 100-50-100-200 4 min recovery	**17** **Team Meeting** Warm-Up Stretch **5 x TJ Approach**	**18** **Home Meet** **vs** **C.J. Yang HS**	**19** **Rhythm Plyos** **Sprint Drills** **3x150 Strides**	**20** **Johnson** **Invitational**	**21** Easy Run or Rest Day
22 **Rhythm Drills** 8 x 50m **Block Starts** **Power Skipping** **Hurdle Hops** **3 x LL–RR–LL–RR**	**23** **Easy R-Drills** **Sprint Drills** **45 x 80 Strides**	**24** **LJ Tech Drills** **TJ Tech Drills** **4 x 120 Tempo**	**25** **Team Meeting** Warm-Up Stretch **5 x LJ Approach**	**26** **Away Meet** **vs** **Toomey HS**	**27** **Rest Day!**	**28** Easy Run or Rest Day

PLANNING AIDS FOR DEVELOPING YOUR TRAINING SYSTEM

LONG/TRIPLE JUMPERS' WORKOUT

Sequence Date:

RUNNING WARM-UP:
Pre-stretch plus:

RHYTHM AND SPEED POLYOMETRIC DRILLS:

LONG/TRIPLE JUMP TECHNIQUE: Drills and Jumps

POWER PLYOMETRIC DRILLS:
❑ Skipping ❑ Hopping
❑ Bounding ❑ Multiple Jumps

RUNNING AND APPROACH DRILLS:

WARM-DOWN:

WEIGHT TRAINING:

NOTES:

SAMPLE LONG/TRIPLE JUMPERS' WORKOUT

Sequence Date: Mon April 9

1 **RUNNING WARM-UP:**
Pre-stretch plus: jog 1600m

2 **RHYTHM AND SPEED POLYOMETRIC DRILLS:** in training flats

3 **LONG/TRIPLE JUMP TECHNIQUE:** Drills and Jumps in spikes on runway
*3-5 approach *3-5 box takeoff and landings
*2x3-step pop-ups *2x 3-step jumps

4 **POWER PLYOMETRIC DRILLS:**
❑ Skipping ❑ Hopping
☑ Bounding ❑ Multiple Jumps
2-step combos: 4-5x RRL/LLR on grass in training flats (step comes at 35% HOP-30% step-35% Jump)

5 **RUNNING AND APPROACH DRILLS:** in spikes
2x300m @ 60%-3x200m @ 70%-4x100m @ 80%-2x50m @ 90%

6 **WARM-DOWN:** jog 800m

7 **WEIGHT TRAINING:** Phase / Speed/Strength Series

NOTES:

CHAPTER

15

Training High Jumpers

High Jump is an event of rhythmic explosion. Strength and spring are certainly important, but those characteristics alone do not necessarily make great high jumpers. In fact, many great high jumpers are not great leapers, and few sprinters develop into exceptional high jumpers. The high jump is the elegant transfer of strength and horizontal speed into vertical lift and clearance of the crossbar.

A Philosophy for Coaching the High Jump

Coaching the high jump, like coaching most events in track and field, is both an art and a science. Designing a training program for a group of athletes that can have a wide spectrum of abilities ranging from girls that start at three feet who eventually can reach as high as six feet and boys who start at four feet and eventually can jump seven feet creates a difficult problem for the high jump coach.

There are several ways to look at the high jump event. In the simplest of terms, it can be described as a somersaulting, twisting, back flip over a cross bar. Or, in order to jump really high, the jumper must convert horizontal velocity (run-up speed) into vertical velocity (speed off the ground) efficiently. The faster the vertical velocity off the ground is, the higher the jumper will raise his or her center of mass. Another way of looking at the high jump is it's a fight against gravity. An object shot from the ground will reach a high point then stall and return to the ground. The high jumper leaves the ground. Therefore, he or she will reach a high point in the trajectory (called an apogee). Hopefully this is where the jumper will clear the bar, and then the jumper will return to the ground (the high jump pit). For a coach to effectively coach the high jump, it is necessary to understand the mechanics of the jump the principals of training, and to have the "tools" to teach the event.

The method of high jumping discussed in this manual is known as the **Fosbury Flop** (named after its originator, the 1968 Olympic champion, Dick Fosbury).

The Flop has become the universal method of high jumping. It is relatively easy to learn, has distinct biomechanical advantages and accounts for almost all of the top performances in the event for the past 40 years. For these reasons, it is the only method of high jumping detailed in this manual.

All descriptions in this chapter assume a left-footed takeoff or jump.

Event Techniques and Skills to Be Taught

When designing a training program for the high jump the coach should keep these techniques and skills in mind:

Speed development
Strength development
Rhythm
Explosiveness
Acceleration
Balance (body control)
Approach run
Running on the curve
Transition
Takeoff
Bar clearance
Use of arms
Flexibility
Event knowledge and rules

The Mechanics of the High Jump

The Flop method of high jumping consists of three basic parts: the run-up, the takeoff and the bar clearance.

The Run-Up

Establishing an accurate and consistent approach to the bar is the *most* important technical aspect of a good high jump. This is achieved by running a "J" shaped approach to the bar. The run-up has to generate speed to the bar that is not too fast or too slow, but is coordinated with the quickness of the force being applied to the ground to produce the highest jump possible and still be able to clear the bar.

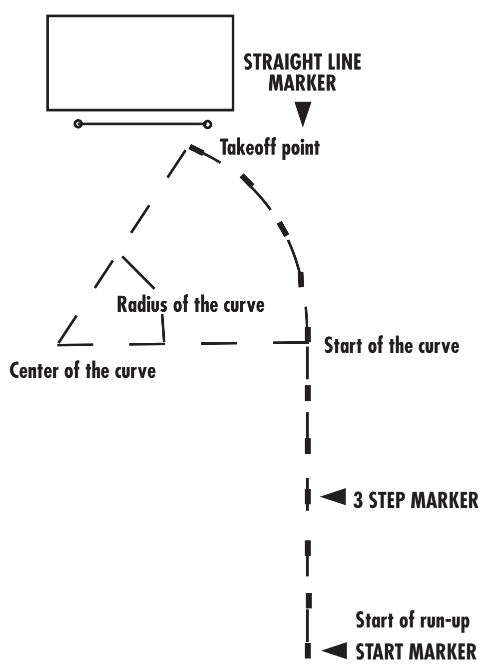
The number of strides to the bar will vary from eight strides for a beginning jumper to as many as twelve for elite jumpers. Ten steps for good jumpers is somewhat standard. The curved run to the bar is one of the most important aspects of the Flop technique. It allows the jumper to jump through the vertical axis of the body, but still generate sufficient angular (rotary) momentum to back flip over the bar. The jumper must stay on the curve *all the way to the plant* so he or she arrives at the takeoff leaning away from the bar from left to right and back to front.

For accuracy to the takeoff point, several techniques are involved. First, four check marks are used: start mark, a three or four step mark (to monitor the start), a straight line mark and the takeoff mark.

The second technique is the eye "flick," in which the jumper focuses the eyes throughout the approach and jump. A jumper should watch the foot hit the three or four step mark. The eye focus should then shift to the straight line mark on steps four and five, and then swing to the standard on the sixth through eighth steps. On the last two steps (penultimate and last step) the eyes do not focus at all. The jumper does not look at the bar at any time during the run-up. Looking at the bar tends to pull the jumper off the curve and causes him or her to jump toward the bar instead of straight up.

Finally, just like hearing the rhythm of a piece of music, a jumper listens to the rhythm in the run-up to control the approach speed. A 1-2-3 rhythm can help to increase or decrease the speed of the run-up.

The approach run should have a gradually quickening rhythm. The cadence starts with a moderate tempo and builds to a very fast last step. The speed to the bar should be consistent throughout a competition and should not change as the bar gets higher! The last four strides must be completed with good tall running posture and inward lean to counter the centrifugal force of running the curve. To reap the benefits of the "J" approach, the athlete must keep each footfall on the curve. This is called "holding the curve."



The distance the jumper begins "out" from the right standard to the straight line marker is determined by the speed of the approach. Beginning and novice jumpers may only be out eight feet. Elite jumpers may be "out" 14 to 15 feet. The "hook" or tightness of the "J" approach must be adjusted to produce a good lean away for the takeoff. Also, the last two strides should be on a line of 35-degrees to the bar.

The Transition and Takeoff

The lean away from the bar from left to right counteracting the centrifugal force of the curved run should be about 70-degrees at the plant touchdown (LRTD) and at the takeoff (LRTO) close to 90-degrees. From back to front the jumper is leaning back at touchdown about 70-degrees (BFTD) and taking off through the vertical axis of the body on takeoff (BFTO). These two "lean aways" create a somersaulting action, and when combined with an upper body 'twist," creates a back flip over the bar.

During the penultimate (next to last) step the jumper should pass over a deeply flexed right leg, maintaining speed and keeping the center of mass low into the takeoff plant. This is a difficult maneuver for a beginning jumper.

In a double-arm takeoff, the right arm is held back on the penultimate step and then moved upward with the left arm on takeoff, stopping when the upper arms are parallel to the ground. The left arm continues a running action all the way to the takeoff.

The swing leg applies force to the ground by moving upward to a 90-degree position and blocks (stops) very quickly. The knee stays at the 90-degree position, but swings under the body from the hips. The foot should be under the knee. The "twist" of the upper body, which turns the back to the bar, occurs very quickly after the foot is planted for takeoff but before losing contact with the ground. The head must turn away from the bar with the shoulders and is not dropped back until the jumper leaves the ground.

Bar Clearance

An efficient bar clearance is important to the execution of a good high jump. The arch over the bar is created by throwing the head back, elevating the hips and keeping the center of mass as low as possible. The arms should be kept along the body or the inside arm can be dropped over the bar. Leading with an arm or straightening the legs after takeoff moves the body parts away from the center of mass and stops or slows the rotation over the bar.

During bar clearance, the hips need to be higher than the shoulders and the knees. The angular (rotary) momentum for the "flip" over the bar is created on the ground from the "hinge" momentum (leaning away from the bar at the plant). If there is not enough momentum to rotate over the bar, the jumper will "stall" and/or pull the bar off with the calves. The problem of a jumper "stalling" in the air is caused by the jumper's shoulders being out of position at takeoff. The jumper must "square" the hips with the bar so just the right amount of "twist" is applied.

After the hips clear the bar, the head is brought forward, the hips are dropped and the legs will be elevated over the bar.

Principles of Training for the High Jump

As with any other event, the *universal* principles of training apply to the high jump.

Progressive Overload

For the athlete's physical capacity for exercise to increase, the body must be subjected to increased stress, or *overload*. The body, in response, adapts to this stress resulting in increased capacity. This cycle of stress and adaptation is the foundation of all training. As discussed in a previous chapter, this is also known as the **SAID** principle, the *Specific Adaptation to Imposed Demands.*

Specificity

The body adapts to specific demands placed upon it; therefore, training for the high jump needs to specifically address the requirements, strengths and skills needed for the event.

Repetition

This principle is an outgrowth of the specificity requirements. Especially with a technical event like the high jump, the neuromuscular patterns of technique need to be enforced through repetition of movement. This usually entails dissecting the jump into its simplest components and performing them repeatedly with proper technique.

Recovery

For the body to adapt to progressive overload, it must rest and recover from the applied stress. High jumpers need a good amount of recovery for their legs to be "fresh." Since much of the training they must do is quite demanding, high jumpers require plentiful rest even though they may not feel tired or worn out. High jumpers cannot jump every day and expect to perform well in competition.

Individuality

Respecting the principle of individuality is an important concept for the coach of high school athletes. It is not uncommon to have jumpers performing at heights ranging from four to almost seven feet. Age and strength differences have profound effects on adolescents. You cannot develop freshman jumpers by having them adopt the training of your best upperclassmen.

Aside from the general principles of training, there are several principles which apply specifically to the high jump.

Accuracy and Consistency

The single most important factor in high jump performance is the execution of an accurate, controlled approach run. The event also requires a consistent and identical run-up in repeated jumping attempts. Accuracy and consistency are the foundation upon which high jumping skills and technique are constructed.

Rhythm

High jumping, as with most track and field events, is an expression of power through rhythm. Rhythm provides a reference for the control of speed and power. Rhythm allows the athlete to relax while exerting tremendous effort and provides a cadence for that effort.

Explosiveness and Acceleration

Within its graceful rhythm, the high jump is an explosion of the body off the ground. The body becomes a projectile accelerated by its own power. The training of jumpers needs to develop this explosiveness specifically, through weight training, plyometric training and jumping.

Body Control (Kinesthetic Awareness)

To excel at high jumping, an athlete must develop the ability to control the body position and posture while in motion on the ground and in the air. The athlete needs to have a *feel* for his or her body and how it moves. Drills and repetition refine this awareness.

Teaching the Flop Method of High Jumping

As a coach, maximize your instruction by emphasizing the development of an accurate and consistent approach run and an effective transition to an explosive jump. The proper execution of the run-up is crucial to successful jumping. This is not always evident because many superior high school athletes jump well despite a poor approach run. The fact is most high jumpers perform below their ability. The basic high jump is relatively simple to do. Excelling at the event, however, involves the development of technique. To understand the high jump, you, the coach, must focus on the entire sequence of approach, takeoff, and clearance as one action, and not merely on the act of jumping *up* to the bar.

INTRODUCING THE HIGH JUMP TO BEGINNERS

The high jump is usually taught in terms of the three phases: the approach, the transition and takeoff, and the clearance.

It is helpful, however, to introduce the event to beginners by starting at the landing pit and working out toward the beginning of the run-up. Once the athlete has gained some basic familiarity with the event, the development of technique proceeds backward from the run-up into the pit. This progression should be done for two reasons. First, young athletes love to jump into a foam pit. Many of us can probably recall the lure of the jumping pits when we were in high school, and those first jumps will provide the motivation to continue with the event. Second, the approach run changes significantly as the athlete learns the event. As technique improves, the approach run lengthens and more speed is carried into the takeoff.

You will find it is helpful to introduce the high jump to beginners with these simple drills done in the following progressive order:

- Have your young high jumpers experience landing on their backs by doing simple two legged backward jumps into the pit. Stress jumping up and landing on the upper part of the back, not on the buttocks or neck.
- Determine the athlete's takeoff foot (right or left) by having the jumper take a short running jump *upward* off one foot as if to do a basketball lay up. That foot is normally the jump foot.
- From three strides out, have the athlete take a running jump and then turn and sit on to the landing pit. Again, emphasize jumping *up* rather than diving back into the pit.

- Next, to develop the sense of jumping from a run-up, have the athlete begin taking scissors jumps from one foot with a three- to five-stride approach over a low bar. This introduces the demand for coordinating the run-up and takeoff. Do this drill at *slow speeds.* This is not a hurdling drill.
- This step introduces the Flop in its basic form. The athlete should perform jumps from a three- to-five stride run-up over low heights. Low heights provide a needed stimulus and obstacle without distracting the athlete from concentrating on technique. You must spend considerable time with this step. Let your jumper develop a sense of his or her own rhythm.
- From a five-stride approach, have the jumper run in off a gentle curve to introduce the use of angular momentum and centrifugal force. At this point, it is essential to teach the athlete to jump straight up! This is when good fundamentals are learned. Correcting mistakes will be difficult later if they become ingrained at this time.
- The next step in the progression focuses on the transition and takeoff. At this point of development, it is quite hard to teach a refined transition into the penultimate stride. Instead, you should teach the transition in terms of rhythm and cadence, emphasizing a long and fast penultimate stride and a shorter last takeoff stride. Having the athlete do three- and five-stride pop up jumps from the grass or apron is helpful. Emphasize a smooth conversion into the jump.
- Now is also the time to teach driving up with the arms and the free leg. This aspect is crucial since downward force at takeoff is generated by these limbs driving forcefully upward. The hands should be punched to face level and the knee should be driven hard to about waist level without the lower leg extending past the knee. Next, have the jumper simultaneously jump or stomp off the takeoff foot. This will propel the athlete straight up off the ground.

  When these elements have been learned, repeat steps four and five stressing good takeoff mechanics.

- The approach run has now been introduced to the beginning jumper. *Now is the time to explain the rudimentary biomechanics of high jumping to your athletes.* Done thoughtfully, this does not require a Ph.D. in physics. First, explain why jumpers must run on the curve to jump their best. Have your jumpers start by running along a curve or circle with a radius of about 17 feet. They can also run a "U" with a similar radius. Placing one foot ahead of the other on the curve will create a natural inward lean from the ankles. Be sure good running mechanics and rhythm are incorporated into this drill. Don't allow exaggerated or artificial posture. The athlete must become comfortable running this way.

Next, plot an approach run for each athlete. For novices, six to eight strides are recommended. (Later, when their technique progresses, you can add additional strides. At this point, it is unlikely a novice jumper will be able to control and utilize the added speed of a longer approach.)

Have the jumper run away from the near standard on a curve (approximately 10–14 foot radius) with strong, bounding strides. The radius of the curve will be determined by the athlete's ability and speed of the run-up, with more advanced jumpers utilizing a larger radius. This will give the jumper an approximate starting point for the run-up. Locating the precise position for the jumper to begin the approach is a process of repetition and adjustment.

- When your jumpers have become comfortable with their run-ups, have them perform full jumps over a bar set at low heights. Forget measuring progress in terms of height. Now is the time to build good technique. Emphasize accuracy, consistency, rhythm, quickness off the ground and jumping straight up. These are the fundamentals of high jumping.

Important! Take your time working through the preceding eight steps. *Take two or three training sessions to progress through these various stages.* Perhaps steps 1–4 on day one, steps 5–6 on day two and steps 7–8 on day three. Don't be reluctant to return to these steps later in the season to reinforce proper mechanics. Finally, coaches should sit their high jumpers down and explain the event to them again to help them visualize what they are trying to do. This will help them focus on *high jumping*, not just jumping up to a height.

COACHING TIPS FOR THE HIGH JUMP

- Learn to be an expert observer and trace the origin of problems backwards from the crossbar. The best viewing point for the coach is directly across from the takeoff point. This affords a thorough view of the approach run, takeoff and clearance.

- Stress consistency and accuracy in every jump. Success in the high jump is usually the result of superior execution, not greater effort.

- The high jump begins with the first step of the approach, not the takeoff. Encourage your athletes to develop a sense of fluid, controlled rhythm. The high jump is an event of rhythmic explosion.

- The most physically demanding task for novice high jumpers is learning the approach/takeoff transition. Controlling your approach speed is essential in making this transition. The flat-flat pattern of the last two strides requires a great deal of practice for young jumpers.

Considerations in Training High Jumpers

- Both the coach and athlete must have an understanding of the physical and technical skills one needs to be a successful high jumper. This means understanding the importance of leg strength, explosiveness, rhythm, flexibility, technique and body awareness.

- The high jump is a technically and physically demanding event. Good high school high jumpers are usually multiple event athletes. Keeping the legs fresh for jumping while training for other events requires a careful plan by the primary coach and other event area coaches. High jumpers should not high jump every day!

- High jumping has an important psychological element. In competition jumpers often face heights they have never attempted. To mentally condition them, occasionally have your athletes attempt higher-than-PR heights in training.

- As mentioned earlier, technical mastery is sometimes impeded by fear of the crossbar and fear of the landing surface. A safe and secure landing pit is essential. Using a padded or soft fiberglass bar will help eliminate the fear of pain from landing on the crossbar in practice drills.

- Coach "consistency." Without it, most of your athletes' training is simply wasted. Training for consistency requires more concentration than physical effort.

- Avoid the temptation to measure every jump in practice. Progress comes from concentrating on the process of training, not on the outcome.

Types of Training for the High Jump

Training for the high jump can be divided into three categories:

- **General training** develops the physical capacity and fitness of the athlete. This encompasses basic running, weight training, plyometric exercise and rhythm development.

- **Specific training** has a direct correlation to the skills necessary for high jumping. Often, that specific training is simply refined general training. Some examples of specific training would be curve running, running and jumping technique drills and specific plyometric drills.

- **Specialized training** duplicates the exact movements of high jumping. This involves exercises that replicate a specific feature or phase of the jump. Some examples of specialized training are full speed approach runs, complete jump attempts, and transition, takeoff or clearance drills.

When coaching high school athletes, the majority of training should be general in nature for three distinct reasons. First, the basic strength, agility and rhythmic skills of young jumpers will improve most with general training throughout the season. Young high jumpers need to develop as athletes before they develop as high jumpers. Second, with large numbers of athletes to coordinate, few coaches can spend the time necessary for intensive, specialized training. Third, most jumpers are multi-event athletes. General training fulfills other event demands as well as those of the high jump.

Specific training teaches athletes to be high jumpers. The proportion of specific training to general training should increase over the course of the season. Specialized training is the refinement of technique. At the high school level, it should account for only a modest amount of the total training regimen.

Like any event in track and field, the high jump integrates many types of training:
- Running
- High jumping
- Plyometric training
- Flexibility
- Weight training
- Testing
- Technique drills

Running

Running workouts for high jumpers develop overall fitness, endurance, rhythm and sound running mechanics. Emphasis should be placed on building a strong, fluid stride and acceleration pattern with relaxed sprinting technique. Long runs during the off-season will strengthen the jumper and prevent injury. A multi-event athlete may need to train for a specific running event. This usually will satisfy the general fitness demands of high jumping.

Sample Running Workouts

- Long, easy distance runs of 2–3 miles (preseason)
- Long sprint repetitions of 400–600 meters (early season)
- Short sprint repetitions of 50–300 meters (all season)
- Rhythmic tempo runs of 100–300 meters (accelerate 10–30 meters, coast 10–30 meters)

Plyometric Training

Plyometric training can be especially beneficial to high jumpers if used correctly. Plyometric drills develop the ballistic muscular strength jumping demands and directly addresses several principles of training for the high jump. Care must be taken, however, not to overdo plyometric training and incur injury. Read Chapter 5 carefully for a complete discussion on plyometric training. These drills must be phased out of training well before major competitions.

Sample Plyometric Workouts

- Rhythmic plyometric drills (skipping and bounding)
- Power skipping and bounding
- Hurdle hops
- Rhythmic run-up jumps

Weight Training

Weight training builds basic muscular strength. The off-season is the best time for jumpers to direct their efforts to the weight room. After the season begins, weight training should be used to maintain strength. If jumpers are training hard early in the season, coaches should not expect great early meet performances. Also, many track athletes are likely to come directly from another seasonal sport, leaving little time to undertake a comprehensive strength training program.

Sample Weight Training Exercises

- Half squats (4 x 10 x 60% SRM or 5 x 3 x 90% SRM*)
- Leg extensions
- Hamstring xurls
- Step-ups or lunges
- Snatches or cleans

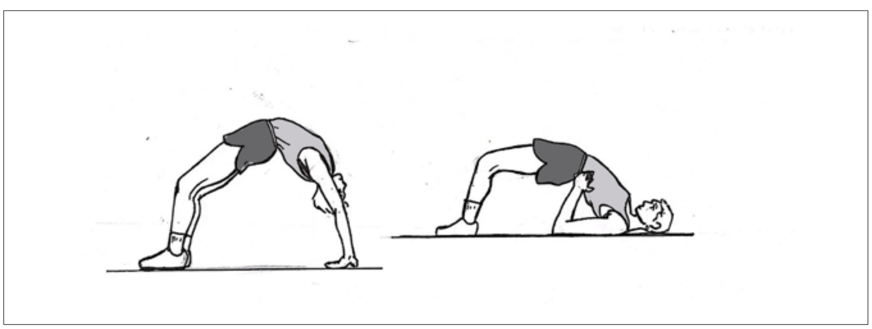
*(*SRM= single rep maximum)*

Technique Drills

Technique drills are the building blocks of high jump technique. All jumpers should incorporate these drills into their training. Note the purpose of each of these drills.

1. High Jump Skip Drill:
Skipping is LL-RR-LL. On the first LEFT takeoff, driving the knee, lift with the arms and land back on the left foot, two RIGHTS, repeat.
Purpose: Warm-up; also teaches knee drive, arm coordination and vertical takeoff.

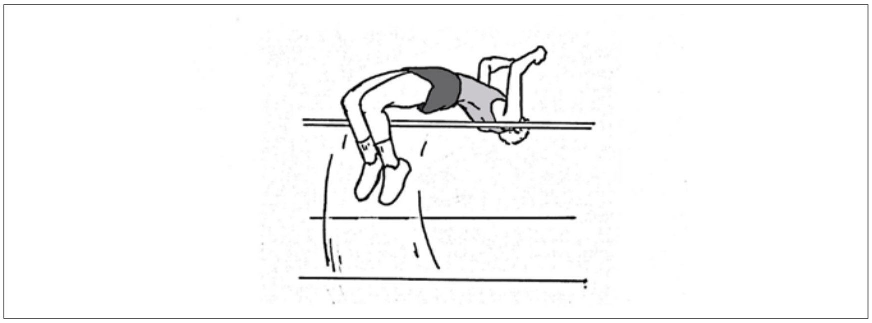
2. "Reverse Spider" and Shoulder Arch Drill:
Lay on your back and reach behind neck with hands, arch back, head back, weight on hands and feet. Shoulders on ground push hips up with hands.
Purpose: flexibility, teaches arch to head back on clearance.



3. Back Flip Over the Bar

With back to bar, jump up and over, delaying feet as long as possible.

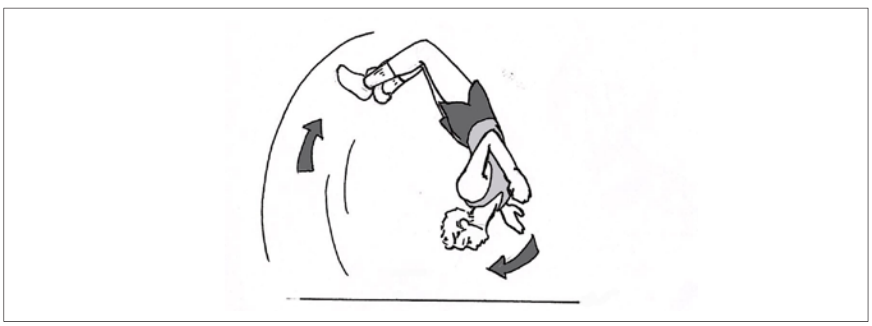
Purpose: Teaches back arch, leg lift and timing.



4. Back Flip to the Stomach

Bouncing on pit, throw head back, jump and land on stomach. Beginners must be spotted and assisted. A must drill to learn.

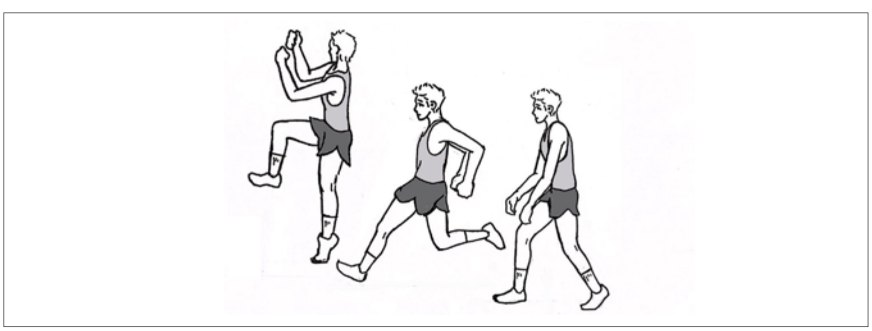
Purpose: Teaches head back, arch and body awareness.



5. 1-2-3 Arm Action Drill

Starting left foot forward, right arm forward, step with right, hold right arm on hip. Step with left, left arm back (both arms are now back)... takeoff!

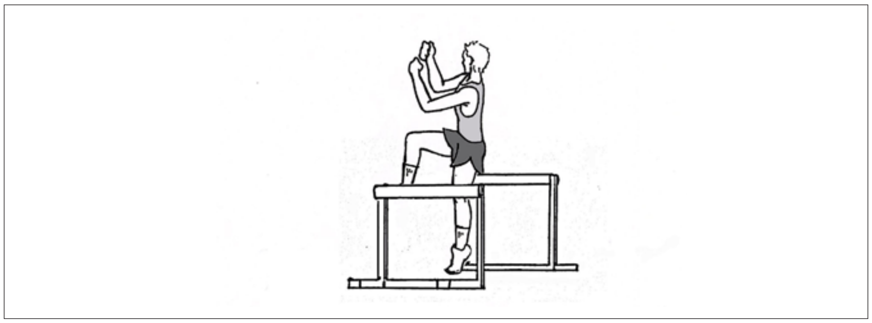
Purpose: Teaches proper arm action. Outside arm keeps moving through the jump.



6. 1-2 Hurdle Drill

Using two high hurdles, step right-left, leaning away from bar.

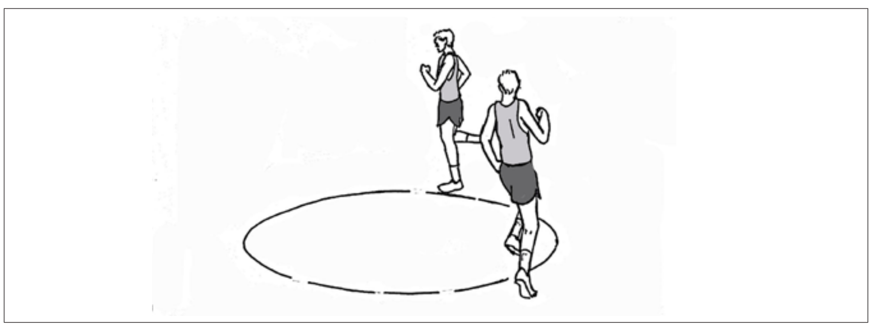
Purpose: Teaches proper plant.



7. Circle Drill

Using cones or lines scribe a 30' circle. Practice running around this…shuttle athletes in and out.

Purpose: Learning to run on a curve.



8. Half Circle "Run-Bys"

Using a half circle to the bar, run by the bar.

Purpose: Staying on the curve to the plant.

9. Half Circle Jumps

Using a half circle approach, jump off the curve over the bar.

Purpose: Learning to jump leaning away from the bar.

10. Five Step Jumps

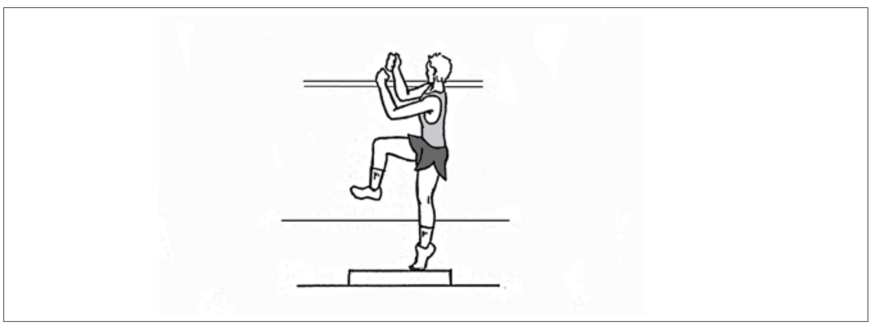
Jumping using only the last five (curve) steps.

Purpose: Allows more jumping and technique work.

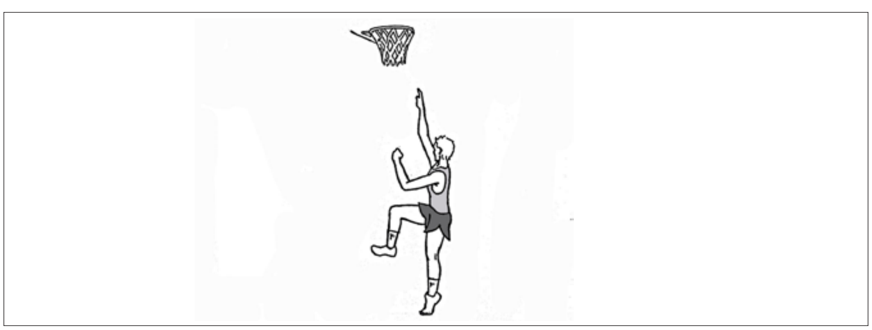
11. Full Run "Run-Bys"
Full run-up, but instead of jumping, run by the bar.
Purpose: Run-up practice accuracy and "staying on the curve-to-the-plant!

12. Timed Approaches
Run-ups are timed when foot leaves the ground at start until foot plants
(about 3.2 seconds)
Purpose: Determine which speed gives the best clearance. Practice consistent run-up.

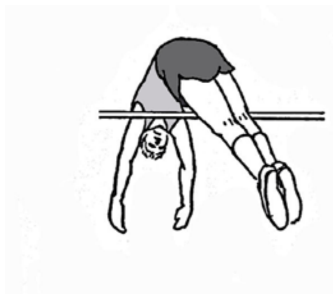
13. Box Jumping
Use a takeoff box, 15 centimeters (6 inches) in height. It will allow the jumpers to jump 30 centimeters (one foot) higher. Mostly for fun.
Purpose: Confidence, more clearance time and fun.



14. Goal Post and Basket
Jumping for height, try to reach as high as you can. Good inclement weather drill in gym.
Purpose: Teaches jumping with Power.



15. "Goofy" Jumps
Jump from the opposite side off of other leg, flop from straight on, straddle jumps, scissor for height, forward flip over the bar.
Purpose: Have fun.



High Jumping

To train specifically, an athlete needs to high jump in training, though not more than twice per week. It is hard to high jump well while engaged in hard training, so schedule jump training accordingly. Jump workouts should address technique, endurance and maximum effort. Each session should emphasize a single aspect.

Technique Jumps. This type of jump training should be done most often. One jump workout per week should focus on technique. Take 10-15 full-approach jumps with the crossbar set at least six inches below PR height. Allow adequate rest between these jumps and stress good technical execution. This is why the bar is set low. If the jumper is performing well, the bar can be raised one or two inches after several jumps.

Endurance Jumps. Endurance jumping develops specific jumping fitness and reinforces the need for consistency. Jumpers should do 20-30 jumps, depending on their fitness. Start approximately eight inches below the athlete's PR and have him or her take three jumps at each height in two inch increments. After two misses at a height, lower the bar.

Maximum Effort Jumps. After a good warm-up, the jumper takes 5-10 jumps at near PR height or better without regard to clearance. This demands intense concentration and maximum effort; however, the coach should continue to emphasize good technical execution. If an athlete performs well in this training session, a new improvement in competition should be close at hand. These workouts should begin early in the competitive season and continue through mid-season. Do max jumping once every two weeks in the early season and once per week with fewer jumps during mid-season. Remember, however, the central focus must be on the process of training, not jumping for height.

Jump Testing

The ultimate test of progress in training is the athlete's performance in competition. Nonetheless, coaches should test the physical skills of their athletes periodically. This helps identify each athlete's areas of strength and weakness, and it provides encouragement and motivation as well. Test three to four times throughout the school year if possible. Testing at the end of the season will provide returning high jumpers with training objectives for the following year.

Sample Jumper Test (2 or 3 x each)

- Vertical jump
- Standing long jump
- Standing triple jump
- 50m sprint
- 8-10 bounds for distance
- 5 consecutive two leg hops
- SRM bench press
- SRM half squat or leg press
- SRM snatch or clean

An Important Reminder About Rest

Many coaches and athletes fail to realize that rest and recovery are an essential part of the training process. *"No pain, no gain"* can only accomplish so much. Sore and exhausted muscles cannot perform well. Sometimes it may be necessary to train through a meet, but when it comes to jumpers, nothing improves performance better than rest.

A Training Periodization Plan for the Season

As with other events, training for the high jump should be periodized over the course of the school year or season. Periodization is the division of training into phases or periods emphasizing different goals and types of training. Periodizing training frames the progress of training and skill development for the high jumper.

Generally, three to four weeks is the maximum period over which athletes can sustain improvement with any single type of training. After that, training results tend to diminish. Accordingly, coaches should integrate different types of training with each other. In a two- to four-week training phase, primary emphasis should be given to one type of training. secondary emphasis to another, and less emphasis (maintenance training) to a third type. Within any training plan, it is not recommended to have more than three quality, or *hard*, training days per week, including competitions. The other days should consist of easy training or recovery days.

The goal of periodization is to manage the stress of training to produce improvement.

Tactics and Strategy for High Jump Competition

Athletes need to be well educated in the rules of the event to make smart tactical decisions during competition, For example, the procedure used for breaking first-place ties in the high jump will often dictate the heights a jumper will attempt or pass in the final stages of a competition. The goal in any competition is to place as high as possible. The next objective should be to set a personal best or simply perform well. Before the meet, coaches and athletes should become familiar with the high jump aprons at away meet sites so practices can be tailored to jumpers' approaches during the preceding week.

Mental Preparation

Pre-meet anxiety can greatly inhibit performance. This nonproductive emotion can leave the athlete drained when it comes time to jump. Athletes must learn to keep nervous energy under control and in reserve for the competition. The best way to accomplish this is to teach athletes simple relaxation techniques and positive visualization skills. All successful athletes see themselves succeeding. All athletes must believe in themselves.

Determining Opening Heights

Use the athlete's warm-up jumps to determine at what height to enter the competition. If an athlete is jumping well in warm-ups, three height progressions, or six inches below the personal best is usually a good opening height. If an athlete is struggling with his or her approach, the coach should have the jumper open at a lower height so he or she can work out problems early in the competition. If the opening height is higher than the athlete is accustomed to starting, have the jumper work his or her way up to that height during his warm-up jumps. This will bolster the athlete's sense of readiness when the competition begins. Never allow your jumpers to wear their warm-up suits in competition at lower heights! With one or two misses, any psychological or tactical advantage is reversed, and the stage is set for disaster!

Determining Height Progressions

In most high jump competitions, the bar is raised in increments of two inches until two or three jumpers remain. Those jumpers then determine the remaining heights to be attempted. It is recommended coaches have their athletes jump at two-inch increments until they are going for the win. Then, the coach and athlete should make a tactical decision whether to proceed by one- or two-inch increments. In league championship and section and state qualifying meets, it is important to anticipate what height will enable the athlete to advance. This mark seldom varies much from year to year. In a qualifying competition, coaches should keep track of the remaining competitors and how they performed at lower heights to determine if a one- or two-inch improvement will be needed for the high jumper to qualify for the finals.

FLOP CHECKLIST

1. Intense concentration on execution.
2. Rhythmic and consistent approach speed. Maximum use of build up speed.
3. Curved run continued to takeoff so there is lean away from the bar (approximately 70-degrees) at the plant.
4. Last two steps of the footpath approach should be 35-degrees to the bar resulting in a 45-degree center of mass clearance.
5. Low center of mass through the penultimate step.
6. The foot plant should be on the "center of mass" line of the approach.
7. **Strong** double-arm action at takeoff, stopping the upper arms horizontal to the ground and returning to the thighs
8. Upper body "twist" takes place **after** the foot has planted.
9. Front-to-back plant created a takeoff through the vertical axis of the body.
10. Outside arm continuous to the plant.
11. Inside arm holds on last step and arms never move backwards together.
12. Aggressive knee drive to a horizontal thigh position.
13. Drive up through the vertical axis of the body (back to front and left to right).
14. No arch on takeoff.
15. Head turns away from the bar **with** the shoulders then **back** (not to the side).
16. Good arch over the bar. Hips higher than the knees and shoulders.
17. Lead leg should not straighten until hips clear.
18. Hold an arched position until the hips clear.
19. Good timing of the lower legs and hip drop.
20. Land on the middle to lower back, arms and legs in front of the body.

PLANNING AIDS FOR DEVELOPING YOUR TRAINING SYSTEM

HIGH JUMPERS' WORKOUT

Sequence Group: Date:

RUNNING WARM-UP:

Pre-stretch Plus:

FLEXIBILITY/MOBILITY EXERCISES:

RHYTHMIC PLYOMETRIC DRILLS:

HIGH JUMP TECHNIQUE:

POWER PLYOMETRIC DRILLS:

- ❑ Skipping
- ❑ Hopping
- ❑ Bounding

RUNNING AND APPROACH DRILLS:

WARM-DOWN:

WEIGHT TRAINING:

NOTES:

SAMPLE HIGH JUMPERS' WORKOUT

Sequence Group: Date: March 6

1 **RUNNING WARM-UP:**

Pre-stretch Plus: 1600m, Surging Alt. 100m in the last 2 laps

2 **FLEXIBILITY/MOBILITY EXERCISES:**

Yoga series plus special HJ stretches

3 **RHYTHMIC PLYOMETRIC DRILLS:**

Swing skipping/ankle bounces/high knees/butt kicks

4 **HIGH JUMP TECHNIQUE:**

Back-overs x 5, Scissor jumps x 5, Pop-ups x 10

5 **POWER PLYOMETRIC DRILLS:**

☑ Skipping 2 x 60m power skips

☑ Hopping 2 x 6H full effort

☑ Bounding 2 x 60m

6 **RUNNING AND APPROACH DRILLS:**

1 x 300m 1 x 200m 1 x 150m at incr, speed

7 **WARM-DOWN:**

800m

8 **WEIGHT TRAINING:**

NOTES:

Team meeting tomorrow at 3:40. Be on time!

SAMPLE 4-WEEK HIGH JUMP TRAINING PLAN, APRIL 1–28

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1 **Tech Drills** Backovers 3-Stride Drills Hip Thrusts **Plyometrics** **4 x 200**	**2** **Tech Jumps** 20 full jumps **6 x 100 Tempo** **Weights**	**3** **Team Meeting** Warm-Up Stretch **Tech Approach** **Runs x 10**	**4** **Home Meet** **vs** **Riley**	**5** **Warm-Up** Stretch 4 x 150 Strides	**6** **Meet** **St. Joe** **Invitational**	**7** Easy Run or Rest Day
8 **Tech Drills** Backovers Scissors Jumps Trans Pop-Ups **Plyometrics** **1 x 300-200-100**	**9** **Tech Jumps** 20-25 full jumps **6 x 50 on Curve**	**10** **Team Meeting** Warm-Up Stretch Rhythm Drills 4 x 80 Strides	**11** **Away Meet** **vs** **Adams**	**12** **Technique Reps** Approach Runs takeoffs **Plyometrics**	**13** **Flexibility Trng** **4x100 on Curve** **2 x 300**	**14** Easy Run or Rest Day
15 **Tech Drills** (full session) **4 x 150** (float-accel-float)	**16** **Performance** **Jumps** **Weights**	**17** **Team Meeting** Warm-Up Stretch Rhythm Drills	**18** **Home Meet** **vs** **La Salle**	**19** **Warm-Up** Stretch	**20** **Meet** **Goshen** **Relays**	**21** Easy Run or Rest Day
22 **Sprint Drills** **Plyometrics** (full session)	**23** **Tech Drills 2-3** **Mile Easy Run**	**24** **Approach Runs** (Rhythm Series) **8 x 150m**	**25** **Warm-Up** Stretch 5 x 100 Strides	**26** **Away Meet** **vs** **Jackson**	**27** **Rest Day!**	**28** Easy Run or Rest Day

CHAPTER

16

Training Pole Vaulters

The pole vault is the most athletically demanding event in track and field. Pole vaulting requires speed, strength, coordination, kinesthetic awareness, gymnastic ability and a unique type of courage. The pole vault entails a certain degree of physical risk which must be controlled by the athlete, coach and necessary safety precautions. Nonetheless, the pole vault is a thrilling event for both the athlete and spectator. Every high school head coach should have adequate knowledge of the event.

A Philosophy for Coaching the Pole Vault

The pole vault is the most complete test of athletic ability in track and field. Good vaulters are almost always good all-around athletes. Pole vault coaches must develop and recruit athletes with a wide range of skills. When selecting potential vaulters, a coach should look for athletes who possess or are willing to develop speed, upper body strength, gymnastic ability, intense concentration and a real commitment to the event. Pole vaulters are often emotionally similar to skiers, surfers or skateboarders – that is, they enjoy physical challenges with some degree of risk.

A coach should first train pole vaulters to be good all-around athletes. Second, vaulters must be encouraged to develop the mental ability to put themselves into unknown areas of effort and achievement. All vaulters must be taught to visualize success.

The complex technique of the pole vault demands coaches teach using the "whole-part-whole" method. In other words, young pole vaulters must be taught to understand the pole vault as a whole first, then learn technique through repetition of specific drills that are essential to learning the event. Finally, partial skills should be integrated into a complete pole vault.

The philosophy for coaching the pole vault must be based on *safety*. Any vaulting drill or exercise carries a certain degree of physical danger for the athlete and even for the coach. *Safe facilities, safe equipment, safe training techniques and continuous supervision are mandatory for the pole vault.*

Ensuring Safe Participation

SAFE FACILITY

Safe pole vaulting requires a safe facility. A pole vault facility includes the landing pit, runway, vault box, standards, vaulting poles and training equipment. The landing pit should meet section, state and National High School Federation minimum standards.

The vault box should be set flush into the runway with no raised edges that can snag a pole during the plant. If the area around the box has an exposed surface, a 2” dense foam Box Collar should be used. The standards should sit on a firm level area, preferably cement pads, and should be covered with Standard Base Protection Pads. The pole vault runway should be smooth and level, and whenever possible directed to take advantage of the prevailing wind conditions (tailwinds). Vaulting into a crosswind or headwind is very difficult even for advanced pole vaulters and may lead to inconsistency, poor technique and unsafe vaulting.

SAFE USE

Coaches must ensure facilities and equipment are used properly. The pole vault pit should not be used as a playground, tumbling mat or lounging area. The straps which secure the landing pit components together must be secured at all times and in good repair. A protective cover should be used whenever the pit is not in use.

Fiberglass vaulting poles are easily damaged. Vaulters must protect their poles by placing them in their shipping tubes and storing them in a safe area. Poles should never be dropped on the ground or allowed to hit unpadded metal standards.
Damaged poles will break!

Coaches and athletes must follow manufacturer recommended guidelines for safe usage. Coaches should never allow a vaulter to use a pole rated below his or her weight.

SAFE TRAINING

Coaches must teach athletes to use safe vaulting techniques in all phases of the vault. In the plant phase, proper grip height for the amount of force generated at takeoff is essential. A hand grip too high for the amount of force generated at takeoff will cause the vaulter to stall and fail to reach the pit. A hand grip too low will cause the vaulter to over-penetrate the pit and risk landing beyond the back or sides of the pit.

Principles of Training

As with any other event, universal principles of training apply to the pole vault.

PROGRESSIVE OVERLOAD

In order for the athlete's physical capacity for exercise to increase, the body must be subjected to increased stresses, or overload. The body, in response, adapts to this stress resulting in increased capacity. This cycle of stress and adaptation is the foundation of all training. It is also known as the SAID principle, the *specific adaptation to imposed demands.*

SPECIFICITY

The body adapts to specific demands placed upon it; therefore, training for the pole vault needs to specifically address the requirements, strengths and skills needed for proper technique in the event.

REPETITION

This principle is an outgrowth of the specificity requirements. Especially with a technical event like the pole vault, the neuromuscular patterns of technique need to be enforced through repetition of movement. This usually entails breaking down the vault into its components and performing them repeatedly with proper technique.

RECOVERY

In order for the body to adapt to progressive overload, it must rest and recover from the applied stress. Pole vaulters need a good amount of recovery to be *fresh* for competition. Since much of the training they must do is quite demanding, pole vaulters require plentiful rest even though they may not feel tired or worn out. Pole vaulters cannot vault every day and expect to do well in competition.

INDIVIDUALITY

Respecting the principle of individuality is an important concept for the coach of high school vaulters. It is not uncommon to have jumpers performing at heights ranging from seven feet to almost 17 feet. Age and strength differences have profound effects on vaulters. Freshman vaulters cannot be developed by using the same training as top upperclassmen.

Aside from the general principles of training, there are several principles which apply specifically to the pole vault.

Accuracy and Consistency

The single most important factor in pole vault performance is the execution of an accurate, controlled approach run and pole plant. This accuracy requires consistent performance of the same approach run in repeated vaulting attempts. Accuracy and consistency are the foundation upon which pole vault skills and technique are constructed. Consistent and accurate vaulting is the best way to guarantee safe vaulting.

Rhythm

Pole vaulting, like most events in track and field, is an expression of power through rhythm. Rhythm provides a reference for the control of speed and power. Rhythm allows the athlete to relax while exerting tremendous effort and provides a cadence for exerting maximum effort at the takeoff. The running rhythm of the pole vault is different than that of a 100-meter sprinter. A 100-meter sprinter must maintain maximum speed for a prolonged period of time, while a pole vaulter must achieve maximum speed at takeoff.

Explosiveness

Explosiveness is a crucial component vaulters must develop. The pole vault is a catapult that launches the body into the air by transferring the energy produced by running through the plant into the pole. The vaulter becomes a projectile accelerated by the energy stored in the pole. A vaulter who is more explosive can run faster, develop more potential energy and vault higher. The training of vaulters needs to specifically develop explosiveness through weight training, plyometric training and vaulting.

Body Control (Kinesthetic Awareness)

To excel at pole vaulting, the athlete must develop the ability to control the position and posture of his or her body while in motion on the ground and in the air. The athlete must develop a "feel" for his or her body and how it moves. Drills and repetition refine this awareness.

Technique, Start-to-Finish

(All following descriptions assume a right-handed vaulter.)

THE PRE-START POSITION, HAND GRIP AND HAND SPREAD ON THE POLE

Standing on the runway (how far back on the runway will be covered later) facing the pole vault pit, the vaulter places the left foot at the start mark with the right foot slightly behind and to the right. The vaulter should hold the pole at his or her side with the hands no more than hip width apart (approximately an 18-inch hand spread). The right hand (top hand) should use a closed grip with the thumb on top.

The right hand supports the pole at the start of the approach and should be held in advance of the right hip at the side of the body about waist high. The vaulter's left hand holds the pole — thumb under, knuckles up — in front of the chest a few inches away from his body. The left elbow should be bent 90-degrees and the right arm should be slightly flexed. The approach should begin with the vaulter tall and upright, holding the pole balanced at a 75-degree angle.

THE APPROACH

The approach in the vault is unlike any other event in track and field. Carrying a pole requires the vaulter to maintain an upright posture with a bounding type of run throughout the full approach. The goal of the approach is for the vaulter and the pole to run as one unit, maximizing efficiency and speed.

The vaulter should use three runway check marks. The first and second marks are for the vaulter; the third is for the coach. The first check mark is placed at the start of the approach run. The second check mark should be placed at the second-stride mark (second left footstrike). The third check mark should be placed six strides (three left footstrikes) from the pole plant and takeoff point to help the coach monitor the consistency of the vaulter's approach.

The beginning vaulter should use a 10–12-stride approach into the pole plant and takeoff. An intermediate vaulter should use a 14–16-stride approach.

No matter what the length of the approach, the last four strides *must* be an aggressive acceleration into the plant and takeoff with a short, fast final stride.

The Start of the Approach

The vaulter's right hand should be held steady in advance of the hip, at waist height. The left hand holds the pole a few inches away from the chest as the initial body lean and the push-off of the left foot tilt the pole toward the pit.

The Acceleration and Pole Drop

Acceleration should continue throughout the approach into the plant and takeoff; however, there *must* be a marked increase in stride frequency over the final four strides leading into the takeoff.

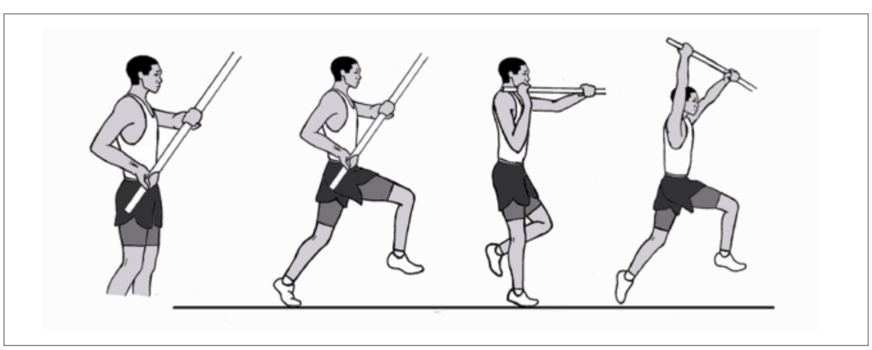
The tip of the pole should be held at a 75-degree angle until the sixth stride from takeoff (third left from the takeoff). At that point the athlete should allow the pole to drop over the next four strides with the natural weight of gravity. This will place the pole at a position just below horizontal two strides (last left) before the takeoff. Using this technique allows the vaulter to run without resistance while maintaining good running posture and mechanics. The vaulter's right hand should be just above waist level at this point. The left hand remains at the middle of the chest and acts as a fulcrum for the pole as the tip nears the box. The vaulter's running form should be smooth and relaxed with the body erect and hips and shoulders facing the pit.

THE POLE PLANT AND TAKEOFF

The plant begins when the vaulter's left foot strikes two strides before the takeoff. The right hand should move vertically up the side of the body, past the cheek and in front of the ear. The left hand, while guiding the pole tip onto the front edge of the box, should also be moving up while helping to turn the pole over so the bend direction (soft side) is facing the pit. In order for a proper takeoff position, the arms must lead and be in front of the leg movement.

During the plant, the vaulter's chest, shoulders and hips must stay square to the pit. The takeoff starts before the pole tip makes contact with the back of the vault box. The vaulter should drive (jump) upward and slightly forward. The vaulters entire body should be in alignment from head to toes, applying force in one upward direction. The right (top hand) and left arm (bottom hand) should be fully extended, and the lead knee (right knee) driving upward.

The vaulter's plant foot should be slightly behind the top hand and in the center of the runway.



THE FOLLOW-THROUGH

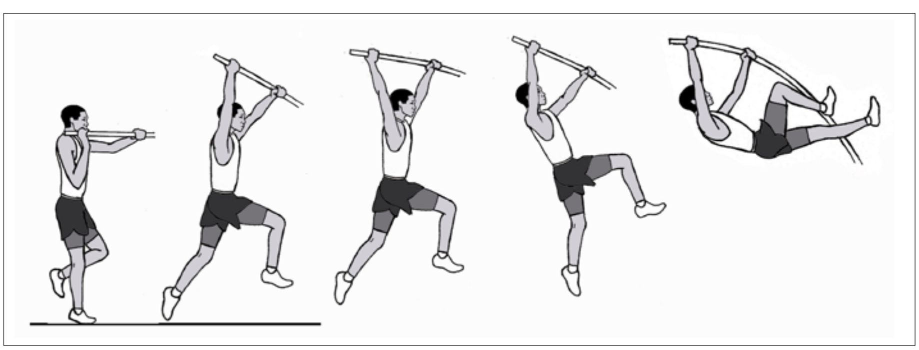
A follow-through phase occurs just after takeoff. The follow-through is more pronounced on a properly bending pole and markedly less on a stiff, non-bending pole. The vaulter's takeoff leg becomes the trail leg and drags behind the hips in a natural follow-through reaction. The arms will attain a gymnastic high bar position above the head as the chest advances toward the pit. The lead leg follows its natural running course and finishes in front of the body with the foot behind the knee. If done correctly, the vaulter's body reaches an "inverted C" position with the handgrip at the top of the "C" and the trailing foot at the bottom of the "C." Achieving a "C" position should not be coached, but, rather, should be a result of a proper takeoff. The head should stay level as both hands are extended and continue to apply pressure down the shaft of the pole. The shoulders should remain square to the pit in advance of the hips.

The Swing

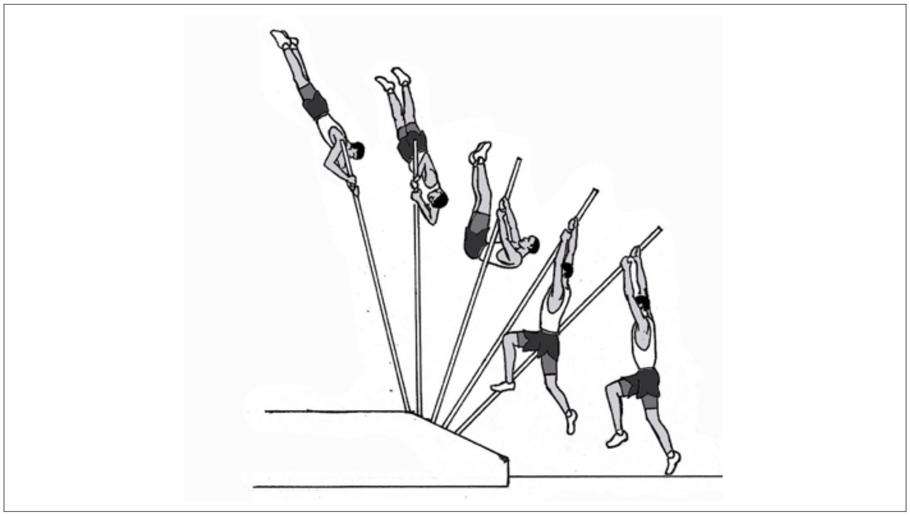
The swing, sometimes called the **rock-back**, starts when the pole contacts the back of the box and the takeoff foot (left foot) leaves the runway. A proper swing is the result of a proper takeoff and a long leg swing and continuous arm pressure (pushing) down the shaft of the pole.

With both arms and hands extended up through the takeoff, the athlete will naturally assume an "inverted C" position. Achieving an upside down vertical position from the "C" position requires both a long, fast-leg swing and continuous arm pressure (pushing) down the shaft of the pole.

Although the left arm may be slightly flexed during this phase, it is important to teach the vaulter not to pull. Pulling will stop forward momentum causing the vaulter to land shallow in the pit. Proper execution will allow the vaulter's body to begin rotation around the pole. Turning should begin during this phase of the vault prior to

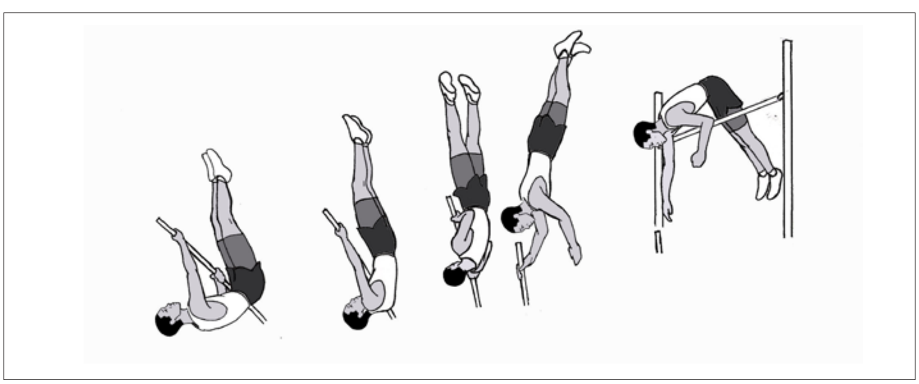


reaching an upside down vertical position. Throughout this phase the vaulter's body should remain extended and the head should stay in line with the spine. At the end of the swing phase, the vaulter's body should be extended in a vertical position, rotated 90-degrees, with feet up and shoulders down in line with the pole.



The Pull-Turn and Push-off

The "Pull-Turn" and "Push-Off" can only be completed properly if the prior phases of the vault have been successfully accomplished. After achieving a fully upside down vertical position, the vaulter should continue the rotation of the body by pulling and rotating around the pole. Staying tight or close to the pole will decrease the ability of the pole to lift vaulter higher faster. The vaulter should remain rigid and rotate around the pole. As the pole becomes vertical, the top hand continues to push down on the pole. The head should be down and in line with the back. The vaulter, then, releases the pole toward the runway with a flick of the wrist.



THE FLY-AWAY AND LANDING

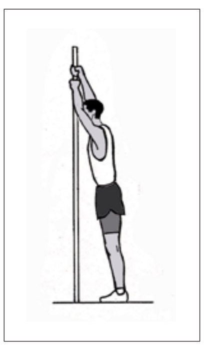
The "Fly-Away" is a continuation from the momentum of the swing. When the body has reached maximum height, the feet will drop and the body will rotate around the cross bar. It is important to teach vaulters to relax during this stage. The most common error is for a vaulter to panic, throwing the arms back and by doing so dislodging the cross bar with the chest. Upon clearing the crossbar, the vaulter relaxes and drops to the pit, landing on the back.

Introducing the Pole Vault to Beginners

HOLDING THE POLE

When first introducing the use of the pole, coaches should teach the correct grip and carry. The pole vaulter should also learn to identify the natural bend direction of the pole by holding the pole loosely at the top with the tip on the ground and letting the pole roll to its natural bend side, or soft side. That side of the pole must be carried down during the run and must be turned to face the pit at the plant. Most poles have a trademark or label indicating the soft side of the pole.

LEARNING TO RUN, PLANT, AND SWING



- After a brief demonstration of a full vault (or after viewing a brief video), the beginning vaulter should be taught the proper hand grip. This is done by standing the pole directly up in front of the vaulter and having him or her reach out and grasp the pole at arm's reach above the head with the right hand. The left hand should then reach straight out and grasp the pole approximately 18 inches below the right hand. Both thumbs should point up.
- A narrow grip is the best way to teach young vaulters how to bend the pole properly. A narrow grip demands proper pole carry, plant mechanics and swing mechanics. Without a large base of support (grip width), the narrow grip only allows proper technical execution of vaulting drills and gives immediate feedback.

  Shock during any part of the vault is an indicator of inefficient technique and energy loss. By using the narrow grip, a vaulter can enhance and expedite the learning process of the pole vault technical model. A vaulter who can bend a pole, at his or her weight rating or above with a narrow grip is achieving near perfect technical execution.
- With a very narrow handgrip, which is slightly higher than can be reached with the

pole vertical, have the vaulter stand on the pit and swing to the ground. Repeat this many times, encouraging the vaulter to keep both arms as straight as possible and apply pressure down the shaft of the pole. The vaulter should swing down to the ground in a straight line. Next, with the vaulter keeping the upper body behind the pole, have him or her bring the right knee up and land on the ground facing the pit where he or she started. Do not allow the vaulter to rock back.

- When the vaulter becomes comfortable swinging on the pole, move him or her three or four steps in front of the box and have the athlete walk, jog, plant the pole and swing into the pit. To help the vaulter, the coach can stand at the box and grasp the pole when the vaulter plants it and then help pull the pole through to the vertical position.

  Coaches should emphasize the correct plant technique and a long swing into the pit with the body fully extended. Gradually add more strides, more speed and a higher hand grip. This progression should not be rushed. Coaches must ensure the vaulter is developing the proper pole carry, good rhythm and a good plant position before progressing to the next drill.

- The progress of the vaulter will determine when the coach should put up a crossbar and have him or her attempt to actually vault over it. With younger vaulters, it may be necessary to put a bar up on the first day of practice to keep them interested. If so, keep the bar low and easy to clear. With older, more mature athletes, it is best to wait two to three weeks before letting them vault at a crossbar. During that time, the vaulter should learn to **air vault** off the top of the pole.

TECHNIQUE GOALS FOR THE BEGINNING VAULTER

- Use the proper hand grip, and bend direction of the pole.
- Carry the pole properly throughout the run.
- Develop a consistent approach run of 10–12 strides with properly placed check marks.
- Accelerate into the plant.
- Assume the proper body/pole positions at plant and takeoff.
- Vault in line with the runway and land in the middle of the pit.
- Do not be concerned with bending the pole right away.
- Establish the rhythm of the plant/swing/clearance.

- Vault consistently in practice with the crossbar set 18–24 inches behind the plane of the back of the vault box. (Require five consecutive clearances at each height before raising the bar.)
- Safely progress to an effective hand grip equal to the height of the bar. (An 11'8" hand grip = an 11'0" vault.)

TECHNIQUE GOALS FOR THE INTERMEDIATE VAULTER

- Master all of the above techniques.
- Use of a wider grip (18").
- Use a consistent approach run of 14–16 strides with properly placed checkmarks.
- Start the approach with a powerful open stride and accelerate aggressively into the takeoff.
- Use good sprint technique and high-knee lift throughout the approach.
- Develop the proper preparation for takeoff that provides lift without reaching or losing speed in the last two strides.
- Complete the plant/takeoff before the pole tip contacts the back of the box.
- Swing through in an extended body position from takeoff to rock-back.
- Bend the pole effectively while following the manufacturer's weight rating.
- Perform safe and consistent vaulting 2–12 inches above the hand grip, while keeping the crossbar 18–24 inches behind the vertical plane of the back of the vault box.
- Perform safe vaulting with a grip 1.90 times the reach height.
  For example, a 7' reach x 1.90 = 13'4" hand grip = a 13'6" vault.

Coaching the Fundamentals

PERFORMANCE OBJECTIVES FOR THE ATHLETE

- Practice safe vaulting techniques.
- Develop a fast and consistent approach run with the pole.
- Perfect the proper pole-plant technique.

- Train to be an all-around athlete.
- Train for optimal performance in competition.

TEACHING OBJECTIVES FOR THE COACH

- Determine each athlete's proper grip height and pole size.
- Develop a consistent approach run.
- Train athletes to use the hands to move the pole into the plant position, three strides before the takeoff.
- Train athletes to plant the pole onto the front edge of the box.
- Train athletes to develop a kinesthetic awareness of proper body/pole alignment at takeoff.
- Train athletes to push and not pull during the plant and swing phases.
- Train athletes to accelerate into the plant/takeoff.
- Train athletes to use a fast swing phase rotating around the pole.
- Train athletes to keep the body behind the pole.
- Teach the vault as one continuous motion.

POLE SELECTION

Selection of the proper pole is crucial to successful pole vaulting. Many factors influence pole selection including the vaulter's weight, height, grip height, hand spread, pole-plant technique, jumping ability and takeoff speed.

For the intermediate and advanced vaulter, use **penetration** and pole bend as your guide. Penetration is the distance the vaulter travels forward into the landing area from the takeoff point. If the vaulter swings too deep into the landing area, or if the peak height of the vault occurs more than 24 inches beyond the horizontal standard setting, there is excessive penetration and the vaulter should move to a stiffer pole. **Poor penetration** occurs when the vaulter fails to swing beyond the front of the pit or the pole fails to come to a vertical position.

Twelve- and 13-foot vaulting poles can accommodate a large variety of handgrips for the beginning vaulter. However, the general recommendation for top hand grip range when bending a pole is between is 18 to six inches from the top of the pole.

Guidelines for Beginning Vaulters

- Never use a pole rated below the vaulter's weight.
- A short approach of eight strides or less and a grip height of 12 feet or less are recommended for learning the fundamentals of vaulting technique.
- Correct takeoff technique is a powerful forward and upward movement with the takeoff foot directly below the top hand in the center of the runway while using the highest possible pole-plant position.
- The vaulter will bend the pole and land in the center of the pit if he or she uses proper plant/takeoff technique.
- The objective of learning proper, safe vaulting technique should always precede clearance height objectives. Achieving a "C" position should not be coached, but should be a result of a proper takeoff.

Guidelines for Intermediate and Advanced Vaulters

- Never use a pole rated below the vaulter's weight. It is not uncommon for vaulters to require poles rated 10–25 pounds above their body weight.
- Before raising a vaulter's grip height, he or she should be clearing heights at least equal to that grip height.
- Use the following guidelines once the vaulter develops a proper approach run and good pole plant/takeoff technique:
- Move to a stiffer pole when the pole bend exceeds 90-degrees and excessive penetration occurs.
- Raise the grip height when excess penetration with a small pole bend occurs.
- Lower the grip height when there is poor penetration and the pole bend exceeds 90-degrees.
- Move to a softer pole when both poor penetration and a small pole bend occurs.

GRIP HEIGHT/TAKEOFF DISTANCE/SIX STRIDE CHECK MARK

The importance of the grip height cannot be overemphasized. Using the proper grip height is the key to developing efficient, safe vaulting technique.

Use the chart below to determine the proper **grip height** on the pole, **takeoff distance** from the back of the box, **six-stride check mark** placement, and six-stride time into the takeoff.

This chart is based on an average reach height of **7'4"**. For any given grip height, shorter vaulters will take off further out and taller vaulters will be closer. Select a grip height based on the vaulter's skill level that allows him or her to swing safely into the pit. Then, based on the chart, place a check mark next to the runway for the six stride mark. Use the check mark to check the consistency of the approach before the takeoff.

BAR HEIGHT	GRIP HEIGHT	TAKEOFF DISTANCE	6-STRIDE CHECK MARK	6-STRIDE TIME
BEGINNING VAULTERS				
7′6″	9′8″	6'4"	32′0″	NA
8′0″	9′11″	6'8"	33′0″	NA
8′6″	10′3″	7′0″	34′0″	NA
9′0″	10′6″	7′4″	35′0″	NA
9′6″	10′10″	7′8″	36′0″	NA
10′0″	11′1″	8′0″	37′0″	NA
10′6″	11′5″	8′4″	38′0″	NA
11′0″	11′8″	8′8″	39′0″	NA
INTERMEDIATE VAULTERS				
11′6″	12′0″	9′0″	40′0″	NA
12′0″	12′3″	9′4″	41′0″	NA
12′6″	12′7″	9′8″	42′0″	NA
13′0″	12′10″	10′0″	43′0″	:01.56
13′6″	13′2″	10′4″	44′0″	:01.53
ADVANCED VAULTERS				
14′0″	13′5″	10′8″	45′0″	:01.50
14′6″	13′9″	11′0″	46′0″	:01.47
15′0″	14′0″	11′4″	47′0″	:01.44
15′6″	14″4″	11′8″	48′0″	:01.41
16′0″	14′7″	12′0″	49′0″	:01.38
16′6″	14′11″	12′4″	50′0″	:01.35

The time for the last six strides does not play a role in the potential success of a vault until the height attempted reaches 13 feet. The times listed on the chart are **hand times** and are averages. A vaulter who does not achieve the average time for these six strides into the takeoff can expect a vault below the height listed for that time on the chart. A vaulter who runs faster than the average time listed can expect a vault greater than the height listed, given proper vaulting technique.

APPROACH LENGTH / STRIDE PATTERN / CHECK MARKS

The approach should use a sufficient number of strides for the vaulter to achieve maximum speed at takeoff while allowing for consistency and control. The first check mark can be determined by the vaulter placing the takeoff foot the correct distance from the plant box, turning to face away from the pit and running the number of strides toward the end of the runway that allows him or her to attain maximum controlled running speed. The start marker is placed where the takeoff foot strikes the runway after 10–16 strides. The second checkmark should be placed two running strides from the first. Hitting this mark is crucial to executing a consistent approach run. These two marks allow the vaulter to check the accuracy of the start of the approach. A third marker placed six strides from the takeoff point should be used by the coach to check the accuracy and consistency of the approach run.

The beginning vaulter should use 10–12 progressively faster strides into the pole plant/takeoff. The vaulter may either count these strides by counting the number of times the takeoff foot strikes the runway (five or six times) or by using visual cues along the side of the runway.

The intermediate vaulter should use a 14-16-stride approach to the plant/takeoff, two strides to the second checkmark, eight strides to the coach's checkmark and six strides to the plant/takeoff mark.

PENETRATING THE PIT

When the vaulter transfers force into the pole during the plant/takeoff, the pole bends and stores that force for recoil. That recoil, horizontal speed and the swing carries the vaulter toward the pit. This is called **penetrating the pit or penetration.** Optimum penetration is the result of using the correct grip height for the amount of force transferred toward the pit at takeoff. The greater the force transferred, the higher the vaulter can grip the pole. Less force transferred will necessitate the use of a lower hand grip.

Good penetration is achieved when the vaulter can swing through and clear a bar with the standards placed at the maximum depth from the vertical plane of the plant box. Poor penetration occurs when the pole fails to reach a vertical position and the vaulter fails to reach the vertical plane of the back of the vault box.

SOLVING PROBLEMS IN POLE VAULT TECHNIQUE

PROBLEM	SOLUTION
Lack of Penetration	Lower the grip height. Correct body posture at takeoff. Increase acceleration over the final four strides into the takeoff. Move the pole into plant position earlier. Aggressively complete the takeoff action. Move to a softer pole.
Poor Pole Plant	Begin the plant action earlier. Correct body posture at takeoff. Use the left hand to move the pole into proper position.
Poor Swing and Extension	Lower the grip height if penetration is poor. Raise the grip height if penetration is excessive. Delay collapsing against the pole too soon. Speed up the swing phase. Apply more upward and less outward pressure on the pole with the bottom arm.

SWING SPEED

Poor penetration will decrease the vaulter's swing speed, making it impossible for him or her to safely rock-back and complete the vault. Excess penetration (too low a grip height for the amount of force transferred at takeoff) will not allow the vaulter enough time to complete the swing and reach the fully inverted position. If the athlete has a proper takeoff, adjusting grip height up or down approximately four inches will usually correct penetration problems.

Methods of Training

Of all track and field events, the pole vault requires the greatest range of athletic ability. Training for the pole vault should include running, sprinting, weight training, plyometrics, gymnastics, flexibility exercises, vault-specific drills and, of course, vaulting.

GENERAL CONDITIONING

The greatest improvements in pole vaulting technique will come with the development of good overall physical conditioning through running and strength development. In order to develop the strength required for the pole vault, the following points should be noted:

- Pole vaulters need to have good strength relative to their body weight, but they do not need to become bodybuilders.
- Priority should be given to the development of explosive power. Plyometrics is an ideal way to develop this explosiveness.
- Pole vaulters must develop the body core to bring together upper and lower body strength development
- To develop a high level of skill there should be a close relationship between the development of strength and the development of rhythm and coordination.
- Flexibility, rest, and recovery also play a major role in enhancing physical development, balance, and conditioning.

Recommended Lower Body Exercises, Without Weights

- Hamstring curls using an elastic strap, either fixed or held by a partner, ankle weights or weighted shoes.
- Lunges
- Step ups

Recommended Body Core Exercises, Without Weights

- Bear crawls
- Backwards bear crawls (up stairs)
- Plank holds (supporting body with elbows and toes facing towards the ground)
- V-Ups (sitting and bringing arms and legs up at the same time)
- Alternate leg and arm V-Ups
- Supermans (body facing down, supported by the mid section, legs and arms off the ground)

Recommended Upper Body Exercises

- Shoulder dips
- Dips into a handstand (use spotters)
- Full arm extension pull-ups on a horizontal bar
- Pull-ups to a front support position on a horizontal bar
- Rope climbing using only the arms
- Rope climbing upside down
- Handstand push-ups
- Push-ups using various arm positions (narrow, wide, normal, front/back)

SPEED DEVELOPMENT

To develop speed and power on the runway, vaulters *must* do sprint work with and without the pole.

- Sprint drills: 1–3 x 20m, 3 days a week
- High knees
- Butt kicks (bringing heel straight up to lower rear)
- Power skipping
- Bounding
- Fast hands/quick feet
- Acceleration sprints: six x 60m, two times a week
- Repeat 300s and 200s: 2–4 reps, one or two days a week during the general conditioning cycle applying proper running technique (70%)
- Repeat 150s: 3–5, one or two days a week, emphasizing relaxation, good stride rhythm and running form
- Repeat 100s: 4–6, one or two days a week (should be faster than the 150s)
- Repeat 50s or 60s: 5–7, one day a week, emphasizing relaxation, good sprint form and acceleration

WEIGHT TRAINING

Weight training should be stressed during the off-season and preseason more than during the competitive phase of the season. When there is an increase in the number of strength development exercises in training (pull-ups, push-ups, plyometrics and gymnastics), there must be a proportionate reduction in the amount of weight training.

Recommended Weight Training Exercises

- Power cleans
- Incline presses
- Squats (full range of motion to toe raised position)
- Leg curls
- Leg extensions
- Seated arm curls
- Lunges
- Step ups

Important!

- Never lift free weights without spotters.
- Start with light weights and do not progress to heavier weights until proper lifting techniques have been learned.
- Develop lower body strength with weight training and plyometrics, and upper body strength with weight training and gymnastics.

GYMNASTICS

Any work on gymnastic apparatus helps develop upper body strength, body awareness (kinesthetic sense), rhythm and coordination for pole vaulters. The high bar, rings, and tumbling are especially beneficial.

VAULTING DRILLS

Drills are the major components of technique development and specific conditioning for the pole vault. The coach should understand the purpose of each of the following drills and how they should be incorporated into a training program.

Drills to Develop the Approach

- Approach Runs. Mark athletes' approach distances on the track and have vaulters plant the pole into a towel or sliding box. Use check marks, as previously discussed. Emphasize consistency, good speed, acceleration during the last strides into the takeoff and the timing of the plant.
- Pole Runs. Develop the pole carry and speed by doing reps of 50–70m with the vaulting pole. It is important to shorten distance if the athlete cannot accomplish the task with good technique.
- Resistance Running. Develop power by doing reps of 30–40m uphill or pulling a sled.
- Speed-Assisted Training. Enhance speed and stride frequency by doing reps of 30–50m with towing or a gradual downhill with and without the pole.

Drills to Develop the Pole Plant and Takeoff

- Plant and Hang. To develop the plant/takeoff rhythm, have the vaulter take a four-stride approach, plant, and takeoff into the landing pit, so the pole reaches the vertical position.
- Pop-Ups. To develop the complete vault rhythm, have the vaulter plant, swing to vertical, pull-turn and push, and land in the pit on the back. Use a narrow grip and a grip height that is 12–18 inches over the vaulter's reach height.
- Sand Vaults. To develop an early takeoff position, dig a hole 12–18 inches deep in long jump pit. Have the vaulter use a narrow grip and grip the pole at a height 18 inches above the reach height. Using a four-stride approach, perform the plant/takeoff so the pole reaches a vertical position. Keep the upper body behind the pole and the legs down. Emphasize taking off just before the pole reaches the bottom of the hole. Gradually increase the grip height when the vaulter is easily penetrating past the vertical.
- European Pop-Ups. With the pole in the box, have the vaulter take a high grip on a stiff pole, mark the takeoff point, and then move three strides back. Perform a powerful three-stride approach, plant and takeoff.
  Emphasize the following:
- Strong plant placing the pole above the head
- An early, aggressive takeoff
- Good plant/takeoff rhythm

- Keeping the shoulders square to the pit
- Full extension of the arms and shoulders

  The vaulter must maintain control and rebound safely to the runway in a balanced standing position.

- Towel drill. Have the vaulter perform the run/plant/takeoff sequence from an approach of three, six, eight and 10 strides. Plant the pole into a towel, movable box or inner tube filled with five pounds of sand. The takeoff action slides the box forward.
- Penetration drill. To develop confidence in the plant, have the vaulter plant the pole firmly, aiming forward and upward, using a short- or medium-length approach with a gradually increasing grip height. The pole should not be overbent as the drill concentrates only on the lift and the takeoff. No attempt should be made to rock back.

Drills to Develop the Takeoff

- Double-leg hops over 6–10 low hurdles, 24–36 inches high placed three feet apart.
- Hurdling over five to seven low hurdles, five to seven yards apart. Have the athlete take a six- to eight-stride run-up and perform a long takeoff to the hurdle and three quick strides in between.
- Sets of 10 bounds over a fixed distance (20–30 meters) with emphasis on power and speed.
- Rope swings using a four-stride approach and taking off forward into a hang. Emphasize an upward and forward drive, transitioning into the swing.

Drills to Develop the Swing and Turn

The objective of the swing and turn is to move the body into position to clear the bar at the greatest height possible above the top hand grip.

- Hanging from a horizontal bar, the vaulter performs a turn around the shoulder axis, turns, and leaves the bar, landing safely on a matt facing the bar.
- Hanging from a horizontal bar, the vaulter turns upside down without bending the arms. Straight legs make the drill more difficult.
- Hanging from a horizontal bar, the vaulter performs the previous drill with the knees tucked to the chest, turning upside down and extending the legs to a rigid position.

- Jumping to grip a horizontal bar, the vaulter swings up and then performs a coordinated pull, turn, and push action. The legs and hips are then extended to clear a crossbar that's set slightly higher than the horizontal bar.
- While holding a climbing rope, the vaulter takes off from a four- to five-stride approach, catches the rope with a narrow grip and then swings on the rope. After reaching the upside-down position, the vaulter pulls, turns, and pushes to clear a crossbar, landing safely in a foam pit on the back.
- With feet attached to one end of a rope running over a pulley, the vaulter holds the other end of the rope in the hands. He or she turns upside down, pulling and pushing the hands toward the ground as he or she shoots the legs upward.

VAULT TRAINING

Vault training includes three types of vaults: technique, endurance and performance. **Technique vaulting** seeks to develop the specific skills in the vault. For example, one session might focus solely on developing a good plant phase. **Endurance vaulting** stresses consistent performance over a number of jumps. **Performance vaulting** aims for the greatest heights possible. Run these sessions similar to a competition. Focus on one type of jumping in each vaulting session.

Tactics and Strategy for Competition

Athletes need to be well educated in the rules of the event to make tactical decisions during competition. For example, the procedure used for breaking first-place ties in the pole vault will often dictate the heights a vaulter will attempt or pass in the final stages of a competition. The goal in any competition is to win or place as high as possible. The next objective should be to set a personal best or simply perform well.

BEFORE THE MEET

Become familiar with the pole vault facilities at away-meet sites so the coach can tailor the vaulters' approaches during the preceding week. The details of pole selection, height of the hand grip, length of the approach run, and placement of check marks should all be worked out in advance of the meet.

MENTAL PREPARATION

Pre-meet anxiety can greatly inhibit performance. This nonproductive emotion can leave an athlete drained when it comes time to vault. Athletes must learn to keep this nervous energy under control and in reserve for competition. The best way to accomplish this is to teach athletes simple relaxation techniques and positive visualization skills. All successful athletes see themselves succeeding, and all athletes must believe in themselves to have a chance to succeed.

While apprehension can cause an athlete to tighten up, run slower and perform with poor technique, the positive flow of nervous energy can increase a vaulter's running speed, alter the acceleration pattern and equally disrupt the approach. Both situations require adjustments in grip height, pole size and approach length. Maintaining one's composure during competition is important. The pole vault is an event that requires continual adjustments and decision making.

DETERMINING OPENING HEIGHTS

A coach should use athletes' warm-up vaults to determine the height at which they should enter the competition. If an athlete is jumping well in warm-ups, three height progressions or 18 inches below the personal best is usually a good opening height. If an athlete is struggling during the warm-up vaults, a coach may have that vaulter open at a lower height in order to work out problems early in the competition.

If the opening height is higher than the athlete is accustomed to, have the athlete work his or her way up to that height during the warm-up vaults. This will bolster confidence when the competition begins. The biggest tactical error made by beginning and intermediate pole vaulters is entering the competition at heights they cannot clear on the first attempt! With one or two misses, any psychological or tactical edge over one's opponents is reversed and the stage is set for disaster!

DETERMINING HEIGHT PROGRESSIONS

In most high school pole vault competitions, the bar is raised by increments of six inches until three or four vaulters remain. The bar is then raised by increments of three or four inches until two or three competitors remain. Those vaulters then determine the remaining heights to be attempted.

In league and section qualifying meets, it is important to anticipate what height will enable the athlete to advance. This mark will only vary slightly from year to year. In a qualifying competition, a coach should keep track of the competitors remaining and how they have performed at lower heights to determine what incremental clearance will be needed for a vaulter to qualify for the finals.

DETERMINE STANDARD SETTINGS

The pole vault standards are the two devices on either side of the pole vault pit which support the crossbar and can be adjusted in relation to the depth of the bar to the plant box. The position directly on top of the back of the plant box is "0." Standard settings in high school can be set between 15.5" (40 cm.) from the back of the box to 31.5" (80 cm.). It is a common belief among top coaches that the standards should be set as far back as legally possible. This distance allows for maximum performance and safety. Standards should be moved forward in rare instances. In order to ensure maximum performance and safety, adjustments should be made with running distance, technique, pole size and pole grip, not in the standard settings.

A Training Periodization Plan for the Season

Given the skill development, strength, agility, and speed required for the pole vault, it is recommended a minimum of two to three hours per week be devoted to practicing proper technique. The volume and intensity levels recommended have been carefully planned to aid the athlete's progress.

Selecting the interval between repetition runs and the various ways in which these runs are used will allow the coach or the vaulter to individualize this program. For example, shorter or longer intervals (rest periods) will make training more or less intense. Running further, over hills, and with or without the pole are other ways of individualizing training.

PRESEASON MINI-CYCLES

FEBRUARY - PRESEASON (MINI-CYCLE #1)

MON	TUE	WED	THU	FRI	SAT-SUN
Warm-Up	Warm-Up	Warm-Up	Warm-Up	Warm-Up	Rest
2 x 250m	Drills	4 x 150m	Drills	4 x 150m	
3 x 100m	Wt Training	5 x 70m	Wt Training	5 x 70m	
Warm-Down		Warm-Down		Warm-Down	

OBJECTIVE: Conditioning, strength, and technique enhancement.
TRAINING NOTES: All running workouts are at 50% intensity.

PRESEASON MINI-CYCLES (CONT)

MARCH - EARLY SEASON (MINI-CYCLE #2)

MON	TUE	WED	THU	FRI	SAT-SUN
Warm-Up	Warm-Up	Warm-Up	**Compete**	Warm-Up	Warm-Up
Vaulting	Drills	4 x 150m		Drills	4 x 150m
2 x 150m	6 x 100m	4 x 50m		1 x 150m	5 x 70m
Warm-Down	Wt Training	Warm-Down		3 x 100m	Warm-Down
				Wt Training	

OBJECTIVE: Maintaining training volume through competition.
TRAINING NOTES: All running workouts are at 66.6% intensity.

APRIL - MID-SEASON (MINI-CYCLE #3)

MON	TUE	WED	THU	FRI	SAT-SUN
Warm-Up	Warm-Up	Warm-Up	**Compete**	Warm-Up	**Compete**
Vaulting	Drills	1 x 150m		Drills	
1 x 150m	4 x 100m	4 x 50m		5 x 100m	
3 x 100m	3 x 50m	Warm-Down		Wt Training	
Warm-Down	Wt Training				

OBJECTIVE: Reduce training volume, increase intensity, and sharpen for competition.
TRAINING NOTES: All running workouts are at 83.4% intensity.

MAY - LATE SEASON (MINI-CYCLE #4)

MON	TUE	WED	THU	FRI	SAT-SUN
Warm-Up	Warm-Up	Warm-Up	**Compete**	Warm-Up	**Compete**
Vaulting	Drills	2 x 150m			or Drills
3 x 150m	3 x 100m	or 4 x 50m		3 x 150m	Rest
Warm-Down	Wt Training	Warm-Down		Warm-Down	

OBJECTIVE: Refine technique and prepare for major competitions.
TRAINING NOTES: All running workouts are at 99.5-100% intensity.

PLANNING AIDS FOR DEVELOPING A TRAINING SYSTEM

POLE VAULTERS TRAINING SCRIPT

Sequence (Indicate order by 1-15) Date:

Time

_____ _____ ❒ Running Warm-Up
_____ _____ ❒ Flexibility
_____ _____ ❒ Mobility _____ ❒ Sprint Drills _____ ❒ Acceleration Sprints

_____ _____ ❒ Vault Drills (indicate order by A-L)

_____ ❒ Plant Drills _____ ❒ Plant Hang _____ ❒ Horizontal Bar
_____ ❒ Pop-Ups _____ ❒ Sand Vault _____ ❒ Coach's Pop-Up
_____ ❒ Approach Runs _____ ❒ Rope Vault _____ ❒ Towel Drill
_____ ❒ Penetration Drill _____ ❒ Rope Swing _____ ❒ Rope Pulley

_____ _____ ❒ Technique Vaulting _____x_____ _____x_____ _____x_____
_____x_____ _____x_____ _____x_____

_____ _____ ❒ Endurance Vaulting _____x_____ _____x_____ _____x_____
_____x_____ _____x_____ _____x_____

_____ _____ ❒ Performance Vaulting _____x_____ _____x_____ _____x_____
_____x_____ _____x_____ _____x_____

_____ _____ ❒ Running Workout _____x_____ _____x_____ _____x_____
_____x_____ _____x_____ _____x_____

❒ Repeats
_____x_____
_____x_____
_____x_____
_____x_____

❒ Approach Runs
_____x_____
_____x_____

❒ Pole Runs
_____x_____
_____x_____

❒ Resistance Running
_____x_____ _____x_____

❒ Speed-Assisted Training
_____x_____ _____x_____

_____ _____ ❒ Gymnastics ❒ High Bar _____ ❒ Floor Exercises
❒ Rings _____ ❒ Trampoline

_____ _____ ❒ Weightlifting

❒ Clean
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❒ Squats
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❒ Bench Press
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❒ Arm Curls
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❒ Leg Curls
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❒ Leg Extensions
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

_____ _____ Other

❒ _______________
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❒ _______________
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❒ _______________
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

_____ _____ ❒ Warm-Down

Notes:

SAMPLE POLE VAULTERS TRAINING SCRIPT

✓Sequence (Indicate order by 1-15) Date: May 3

Time
5:00 1 ☑ Running Warm-Up
5:00 2 ☑ Flexibility
10:00 3 ☑ Mobility _____ ☑ Sprint Drills _____ ❐ Acceleration Sprints

30:00 4 ☑ Vault Drills (indicate order by A-L)

B ☑ Plant Drills | _____ ❐ Plant Hang | _____ ❐ Horizontal Bar
C ☑ Pop-Ups | _____ ❐ Sand Vault | _____ ❐ Coach's Pop-Up
A ☑ Approach Runs | _____ ❐ Rope Vault | _____ ❐ Towel Drill
_____ ❐ Penetration Drill | _____ ❐ Rope Swing | _____ ❐ Rope Pulley

30:00 5 ☑ Technique Vaulting 3 x 11′ 3 x 12′ _____x_____
3 x 11′6 3 x 11′6 _____x_____

_____ _____ ❐ Endurance Vaulting _____x_____ _____x_____ _____x_____
_____x_____ _____x_____ _____x_____

_____ _____ ❐ Performance Vaulting _____x_____ _____x_____ _____x_____
_____x_____ _____x_____ _____x_____

5:00 6 ☑ Running Workout 2 x 150m _____x_____ _____x_____
_____x_____ _____x_____ _____x_____

❐ Repeats
_____x_____
_____x_____
_____x_____
_____x_____

❐ Approach Runs
_____x_____
_____x_____

❐ Pole Runs
_____x_____
_____x_____

❐ Resistance Running
_____x_____ _____x_____

❐ Speed-Assisted Training
_____x_____ _____x_____

_____ _____ ❐ Gymnastics ❐ High Bar _____ ❐ Floor Exercises
❐ Rings _____ ❐ Trampoline

_____ _____ ❐ Weightlifting

❐ Clean
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❐ Squats
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❐ Bench Press
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❐ Arm Curls
_____x_____ @ _____
_____x_____ @ _____
_____x_____ @ _____

❐ Leg Curls
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Notes:

Chapter 17

Training Shot Putters and Discus Throwers

The shot put and discus throw are the strength events of track and field. More than any other events, the shot put and discus rely on the direct application of power.

In physics, power is defined as work divided by time. In other words, if an athlete does more work in the same amount of time, power output increases. Likewise, if an athlete does the same amount of work in less time, then power output also is increased. In both throwing events, power is the critical component.

The shot put is usually considered a *pushing* event while the discus is regarded as a *slinging* event. Because both the shot put and discus throws require athletes to generate and effectively apply great power, they are arguably the most technically complex events in track and field.

A Philosophy for Coaching Throws

The shot put and discus, commonly called the **throws** in high school track and field, are intricate and complex events requiring great power. Unlike what happens in other events, throwers either spin or move backward (i.e. glide) in order to create power and propel the implement into a defined area. These multiple demands require throwers to possess a wide range of athletic skills: explosiveness, strength, balance, coordination, timing, kinesthetic awareness, concentration and the ability to relax while exerting maximum effort. Training for the throwing events involves a great deal of technical work, weightlifting, running and plyometrics.

Often, coaches shuttle their least-able athletes into the throwing events. This is a mistake. In fact, the throws are significantly more demanding than most other field events. Though the shot put and discus do not require tremendous aerobic conditioning or blazing sprint speed, they require numerous dynamic skills to be performed in concert. High school throwers should be good athletes to start. Less fit or less mature athletes should begin in other events, where their athletic capacity can be developed and rewarded.

As with the other track events, throwers should be trained to be athletes first. For the beginning thrower, the entire season will be a learning experience emphasizing general fitness and technical improvement. Strength, coordination, balance and fundamental technique should be the focus of training. For the experienced thrower, the focus is on rhythm and explosiveness blended with refined technique.

Safety Considerations in Events

The primary consideration in coaching the throwing events is *safety*. Before any throwing or training occurs, a discussion of safety for both throwing and weight training is crucial for all athletes on the team, not just the throwers.

The landing area for the throwing areas should be *flagged off (this would include a safety "buffer" zone outside the sector lines), a safety cage should surround the throwing rings* and a fence should guard the end of the throwing area to stop the shot or discus from escaping and causing injury.

Shots and discus should not be rolled back to the throwing area; they should be *carried back* to avoid injuries. Athletes and coaches who are not throwing should *stand behind the caged throwing area* to avoid being hit by a stray implement. Coaches should always take caution! Both the shot and discus become dangerous and potentially lethal once in flight.

When dealing with groups of throwers, make sure the athletes know how to retrieve implements. NEVER allow an athlete to retrieve an implement when there is another athlete in the ring. In addition, no athlete (or coach, or spectator, or official!) should ever turn his or her back to an active ring. Errant throws are impossible to predict. One way to make a throwing sector a little safer when dealing with large groups is to have athletes throw in groups of three, four, or five where one group is designated as the throwing group, the other is the retrieving group, and other groups can be doing drills in a designated safe area. Each group gets a chance to go through two rounds of throws then all groups rotate places.

Ultimately safety is the responsibility of EVERYONE in the throwing area. One moment of inattention can lead to a tragedy.

Principles of Training

As with all other track and field events the universal principles of training apply to the throws.

PROGRESSIVE OVERLOAD

In order for the physical capacity of the athlete to increase, the athlete's system must be subjected to stress or overload. The body, then, adapts to that stress, which results in increased capacity. This cycle of stress and adaptation is the foundation of training. It is also known as the **SAID** principle, the *specific adaptation to imposed demands.*

SPECIFICITY

The body adapts to specific demands placed upon it. Therefore, training for the throws must specifically address the requirements, strengths and skills needed for those events.

REPETITION

This principle is an outgrowth of the specificity requirement. Especially with a technical event, the neuromuscular patterns of technique must be reinforced through repetition of movement. This usually entails isolating the throwing process into components and performing them repeatedly with sound technique. Drill repetitions are the heart of throw training.

RECOVERY

In order for the body to adapt to progressive overload, it must rest and recover from the applied stress. Throwers cannot throw and weight train every day and expect to perform explosively in competition.

INDIVIDUALITY

Respecting the principle of individuality is most important to the coach of high school throwers. Differences in physical maturity and strength are great among high school athletes. Coaches should not expect less mature athletes to do the same volume of work that is demanded from upperclassmen.

In addition, there are principles of training that are specific to the throwing events.

Rotational Acceleration

Both the shot put and the discus throw use the rotation of the body to accelerate the implement to its point of release. Even the conventional glide technique of shot putting uses the rotation of the hips, trunk, shoulders and free arm to drive the shot outward. A coach must understand the mechanics of rotary motion and inertia to properly train his or her athletes.

Balance

Balance is essential to good execution in the throws. The athlete needs to maintain balance in order to apply power effectively. This fact is especially true for the shot put spin technique as well as the discus. Without balance, the application of power is negated. Think of the throwing events as dances of explosive effort.

Rhythm

Rhythm is essential to the proper acceleration of the weighted implement in the throwing events. Just as in the jumps, rhythm provides a framework for the application of power; furthermore, just as dancers are graceful and fluid, so must throwers be too.

Body Control

Throwers need to possess excellent kinesthetic awareness. In the discus, for example, the body moves forward, backward, spins and is airborne all at the same time. Throwers must develop the capacity to sense and control their body positions while moving powerfully.

Relaxation

Throwers must be able to relax while exerting absolute effort. The throwing events require the greatest single exertion of power, yet are completed in the briefest amount of time of any track and field event. The complicated sequence of execution in both throws demands relaxed effort. Lack of relaxation keeps the athlete from achieving the necessary positions from which to apply power. Intensity is not the same as tension.

The Mechanics of Throws

The aim of both the shot put and discus throw is to propel the implement as far as possible to land within the designated sector. Quite simply, the distance covered by any projectile is a function of five factors:

1. The implement's speed at release
2. The angle of release
3. The height of of the implement at release (relative to the landing area)
4. The angle of attack (the difference between the angle of release and the discus' horizontal axis)
5. Atmospheric conditions (including humidity, wind, temperature etc.)

The most influential of these five factors for most throwers is "speed of release." The angle of release is easily adjusted by the thrower. The height of release is largely limited by the stature of the athlete and may vary only a few inches. The angle of attack is critical to discus throwers, but throwing a "flat" discus (and not a "full moon") is quite easily corrected, even in beginning throwers. And, finally, atmospheric conditions are completely out of the control of the thrower, so that is not as much of a concern as a coaching point.

Coaching the throws boils down to understanding how to best optimize the angle and height of release while maximizing the speed of release. Every drill and repetition should have this as its ultimate goal. Contradictory as it may seem, this doesn't mean that every drill, throw or exercise needs to be done fast because, "Sometimes you have to slow down now to speed up later!"

Acceleration of the shot or discus results from the application of horizontal, vertical and rotational force of the body to the ground and the implement.

In the glide shot put style, a combination of horizontal and vertical force accelerates the body from the back to the front of the throwing circle. As the thrower lands in the middle position, the legs drive forward and up and the hips and torso rotate to the front of the circle. Simultaneously, the throwing arm further accelerates the shot as it pushes away from the body. The spin shot put style adds horizontal rotation at the beginning of the throw in order to create greater velocity at the point of release.

In the discus throw, the thrower attempts to perform a long acceleration of the implement by applying rotational and linear horizontal force at the rear of the throwing circle. When the thrower reaches the power position, vertical force is also applied to create an optimum angle of release. As the hips turn to the front, the free arm pulls in to shorten the axis of rotation and the front leg blocks. This transfer of momentum further accelerates the throwing arm. The final acceleration of the discus results from the pull of the throwing arm through the point of release.

The optimum angle of release for the shot put is roughly 40-degrees, depending on the height of the release. For the discus throw, the best angle of release varies between 34- and 40-degrees depending on the wind and height of release. The angle of attack (the difference between the angle of release and the discus' horizontal axis) should be 5- to 10-degrees. Distance is also aided by the construction of the discus itself. A hollow discus with weight distributed away from the center will hold its spin better and increase the aerodynamic stability of the implement.

Understanding the Techniques

SHOT PUT TECHNIQUE

The two most common techniques of shot putting are the **glide** and the **spin**. The glide technique is an easier technique for high school athetes to learn, but the spin technique may have more advantages for certain athletes.

Smaller throwers may benefit from the spin technique, which compensates for the lack of long levers with superior speed generated by the spinning motion. Throwers who are adept at pivoting or spinning may be candidates for the spin technique; however, for high school throwers, the glide is a more consistent technique.

The glide technique is usually favored by larger throwers who have trouble spinning within the small shot circle. They also benefit from the longer pull gained from the power position of the glide technique. Long throws have been achieved with both styles, but all beginning throwers should learn a little about the glide before even attempting the spin. This is so a young thrower can learn and understand the concept of the proper power position.

Note: Discussion of all technique refers to *right-handed* throwers.

The Glide

Standing at the rear of the ring with his or her back to the throwing area, the glide begins with the thrower's weight solidly over the right foot (the toes of the right foot are pointed directly opposite of the landing area) and the left arm dangling and relaxed (see Figs. 15-1 and 2). Just before the left leg is to be driven toward the board, the athlete should lean backwards and start to gently fall back into the ring. This procedure is called **unseating** and provides momentum for the shift across the ring.

The left leg is extended, or actually driven, towards the toe board, and should not be lifted too far off the ground as it extends (see Fig. 15-3).

The upper body should remain **closed** ("closed" refers to the position of the thrower's

GLIDE SHOT PUT POSITIONS

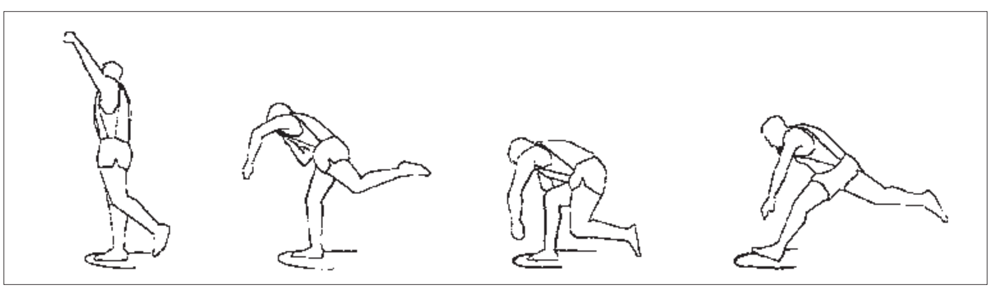

Fig. 15-1. Fig. 15-2. Fig. 15-3. Fig. 15-4.

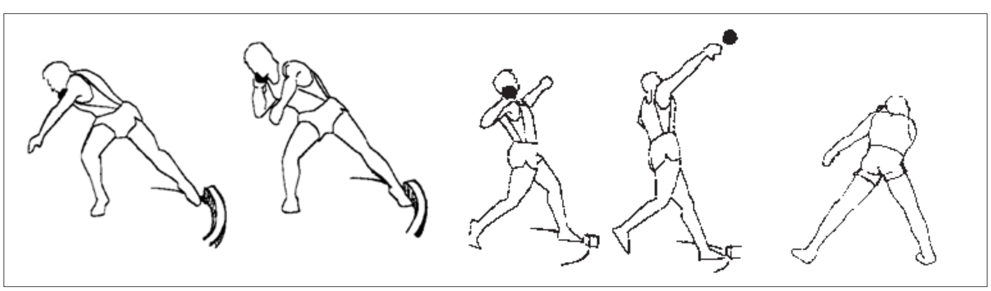

Fig. 15-5. Fig. 15-6. Fig. 15-7. Fig. 15-8. Fig. 15-9.

shoulders, which should be square to the rear of the ring, with the thrower's back facing the throwing sector), and the left hand should reach back towards the rear of the circle. While the left leg is driving toward the toe board, the right leg extends as well, so a split position is attained. The split position will look like the thrower is actually trying to perform the splits (see Fig. 15-4).

Immediately after the split position is hit, the right foot is pulled underneath the body as it turns 90-degrees counter-clockwise. The shoulders remain closed,with the thrower's back still facing the throwing area.

When the right foot is fully recovered beneath the upper body, the center of mass should be over the ball of the right foot. The center of mass is then immediately shifted forward onto the left leg to generate more linear momentum (see Fig. 15-5). This completes the **glide** phase of the throw. The position of the thrower should at this point resemble that of the start of a stand-throw.

From the stand-throw position, the thrower drives up with the right leg and begins to shift the body weight forward onto the left leg. At this point, timing between the upper and lower body is essential to ensure the body weight is not shifted forward too soon, causing a low line-drive throw. If the body weight is shifted forward too late, a higher throw with little linear momentum will result (see Fig. 15-6).

Before continuing, one note should be made about the action of the right foot as the thrower moves from the glide phase to the **throwing** phase. As the right foot is recovered underneath the upper body, the thrower should spend as little time as possible in transition to the throwing phase. Body weight should be shifted off the right foot as soon as it hits the ground beneath the upper body. When the transition is done properly, the only part of the right foot that touches the ground is the *ball of the foot.*

The upper body will begin **opening up** at this stage, in preparation for the arm strike at the end of the throw. This happens in conjunction with the legs driving the center of mass up and across the ring. This portion of the throw should receive the most attention and involves complex body coordination that requires many hours of practice.

As the shot is thrown, the concept of **extension** should be practiced. The shot will be pushed outward as the center of the mass is shifted from the right to the left foot. At the same time, the legs extend upward to lift the shot. This leg extension is coupled with the extension of the throwing arm. The position reached when the shot is delivered by the arm is called the **power position.** It should be noted that when the shot is being released, the head should be thrown back to allow an upward delivery—at this point the thrower's entire body will resemble the shape of the letter "C" after it has been turned inside out—throwers refer to this position as the "inverted C." (see Figs. 15-7 and 8.)

A follow-through, called the **reverse,** is applied to the end of the throw. This allows for a long pull while avoiding fouling. The athlete should not watch the shot as he or she reverses but, rather, look off to the side of the sector. Watching the shot usually causes the center of mass to move out of the front of the ring, resulting in a foul throw (see Fig. 15-9).

The left foot is forced out of its position next to the toe board and is replaced with the right foot, which should land flat to ensure better balance. The right arm which has been extended to throw the shot should immediately be brought back over the top of the body to a position pointing to the center of the ring.

The Spin

Compared to the glide, the spin technique allows for longer acceleration of the shot before the power position is reached. However, this technique is more intricate than the glide and requires the thrower to spin 1¼ times around within a 7-foot circle before the shot is released. While it is true this style can produce some very long throws, it is sometimes harder for the beginner to master.

The spin (or rotational) technique begins with the thrower balancing his or her weight on both feet in the rear of the ring with the back to the landing area. The shot may be held a little *higher on the cheek* for the spinner. This allows the hand to release the shot easier.

As the thrower initiates the spin, there should be a shift of weight from the right foot over to the left foot. The center of mass should be directly over the ball of the left foot to allow a smooth pivot as the thrower turns in the back of the ring (see Figs. 15-10 and 15-11).

While pivoting, the thrower should be looking straight ahead, not at the ground. Once the thrower has completed the first 90-degrees of the turn, the right foot sweeps outside of the ring and then drives forward toward the right sector line.

The beginning thrower will want to drive his or her right leg toward the center of the ring, but this is incorrect. Rotational forces must be taken into account. As the right leg drives toward the right sector line, the pivoting action will cause the right leg to move to the left as it is driven out. If the right leg is driven toward the center of the ring, rotational forces will cause it to land far to the left of center of the shot ring. The right leg must compensate for the rotational forces pulling the thrower around.

A second component of the initiation from the back of the ring is the push of the left leg. The left leg thrust across the ring, coupled with the right leg drive toward the right sector line, causes the thrower to move across the ring. When the right foot lands in the center of the ring, it should begin pivoting immediately.

This is a hard task for beginners because it requires good balance on the ball of the right foot as it makes contact with the ground. While the right foot pivots, the left foot should be picked up and set down against the toe board. The toe of the left foot should align roughly with the heel of the right foot. As the left foot makes contact

SPIN SHOT PUT POSITIONS

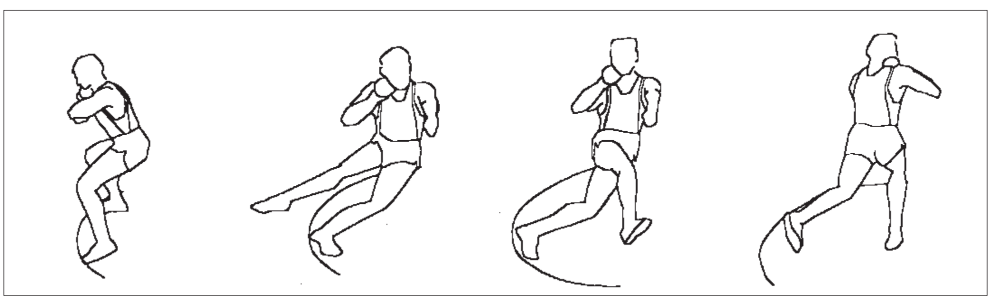

Fig. 15-10. Fig. 15-11. Fig. 15-12. Fig. 15-13.

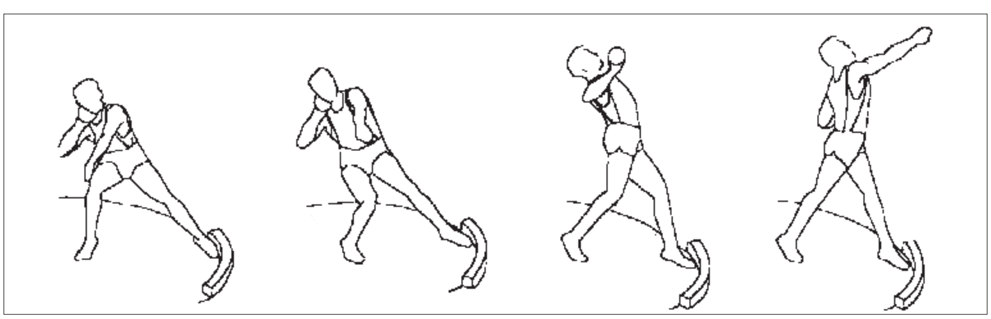

Fig. 15-14. Fig. 15-15. Fig. 15-16. Fig. 15-17

with the ground, the center of mass should still be balanced over the ball of the right foot, with the shoulders closed to the front. This position should resemble the beginning of the stand-throw (See Figs. 15-12 to 17).

From the time the left foot pushes off the ground to when it is set down by the toe board, the right foot should continue to pivot. Once the stand-throw position is reached, the hips begin to rotate along with the right foot. Simultaneously, the right leg begins to extend, or straighten. This causes the body to **corkscrew.** As the body sets to shift weight from the right leg to the left leg, the shoulders start to open up.

The final phase of the spin technique involves the release and the **reverse.** When the center of mass is shifted forward over the block leg (i.e., the left leg), the hips and shoulders pivot around until the shoulders are square to the throwing area. The release of the shot is followed by a reverse similar to the steps described at the end of the glide technique (see Fig. 15-9). Throwers will find it easier to reverse at the end of the spin because they already possess quite a bit of rotational momentum. On the other hand, it is easier to **pull away** or **spin out** from the finish of a throw, making the spin a more inconsistent technique for beginners.

Coach's Viewing Angles

When watching the shot put, a coach should view from three different angles: from the back of the shot ring, from the side of the ring facing the throwing arm of the shot putter and from the front of the ring. Each viewing angle allows the coach to evaluate different components of the overall throw.

The view from the rear of the ring provides a good look at the line of power established as the thrower glides or drives across the ring. This view is also ideal for seeing if the shoulders are open or closed as the thrower hits the middle of the ring.

Viewing from the side of the shot ring is the most common position used by coaches. This view gives a good look at the left leg drive to the board and the push off of the right leg out of the back of the ring. The opening of the shoulders and length of pull on the shot can also be seen well from this angle.

Watching the throw from the front of the ring provides a different view of the opening of the shoulders and the left leg drive to the front of the ring. This angle allows the coach to see how well the thrower **squares up** to the throw or if the spin-

DISCUS TECHNIQUE POSITIONS

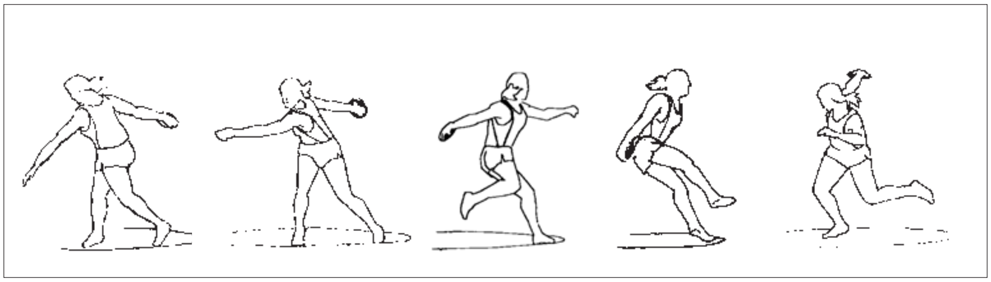

Fig. 15-20. Fig. 15-21. Fig. 15-22. Fig. 15-23. Fig. 15-24.

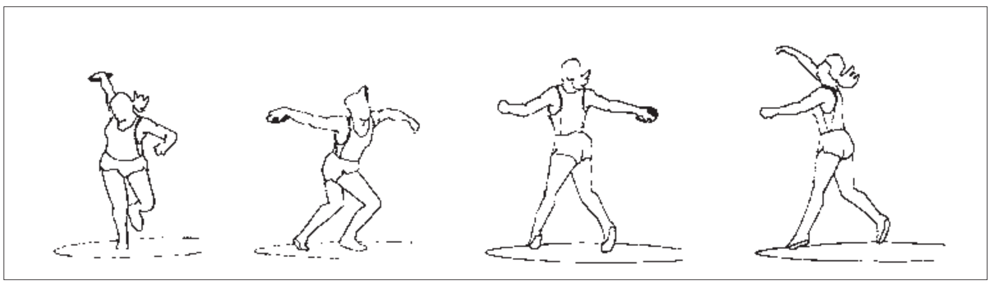

Fig. 15-25. Fig. 15-26. Fig. 15-27. Fig. 15-28.

ner over-rotates out of the back.

The choice of angles from which to view depends on the particular skills the thrower is perfecting and the coach's preference.

DISCUS THROW TECHNIQUE

The primary body movements of discus technique are essentially the same as the rotational technique for the shot put. The ideal athlete for discus throwing is tall with long arms and legs and quick feet. Successful discus throwers have come in all shapes and sizes, but this body-type seems to have the most success in the event.

The complete discus throw should have a distinct rhythm, building from slow to fast. The discus thrower should start in the back of the ring with a nice, relaxed wind of the discus to start the rhythm as the weight stays evenly distributed over both feet (see Figs. 15-20 and 21). The wind should not be too fast or dramatic.

As the thrower "unwinds," the legs should bend and the center of mass should be shifted over the ball of the left foot (see Fig. 15-22). The shoulders should remain parallel to the ground with the left arm extended straight in front of the body.

As the center of mass moves over the left foot, the thrower should drive off that foot immediately. This movement is referred to as **drop and go.** As the left foot pushes, the right foot sweeps around underneath the left armpit and the thrower rotates out of the back of the ring (Fig. 15-23). The combination of the left leg drive and the right leg sweep gives the thrower good linear impulse across the ring.

Hip-shoulder separation is also established at this point, as the right leg sweeps underneath the armpit to get ahead of the upper body. The head should look straight away from the chest, as the discus is wound, and then turned to look at the left arm as the thrower comes out of the back of the ring.

Once linear drive has been established across the ring, the thrower should actually be airborne. At this point, the right leg will be tucked in, beneath the upper body, and the knees brought together to increase the speed of the left foot coming back to the ground. After the initial drive out of the back, the right leg will be the first to contact the ground at the center of the ring (see Fig. 15-24). The left leg should touch down as soon after the right as possible to create the longest arm pull possible on the discus (see Fig. 15-25).

As the thrower reaches the stand-throw position, the shoulders should remain parallel to the ground with no dipping whatsoever. The right foot should also continue to pivot and should continue to do so until the discus is released.

When the athlete is pulling the discus around to the release point, the right foot must continue to pivot in order to maintain the hip-shoulder separation attained at the initial turn (see Fig. 15-26). If separation is not maintained, an **arm throw** will result — and much power lost. The discus throw is actually a sling, aided by a stretch-reflex reaction prior to release. The left side of the body should remain firm, with the left leg (the **block leg**) blocking as the right side rotates through release. At release, the head should be thrown back allowing the chest and hip to rise and give lift to the discus (see Fig. 15-27). After the discus is released, a reverse can be added to avoid fouling (see Fig. 15-28).

Viewing Angles for the Discus

The same angles should be used for watching the spin shot put and the discus. The side view provides a good look at the arm strike, as well as a good look at the hip drive during the release. This is also the best view to see the linear drive generated out of the back of the ring. Viewing from the back and front of the ring, a coach can see if the athlete over- or under-rotates when leaving the back of the circle. This view is also ideal to see if the shoulders are open or closed as the thrower reaches the front of the ring and whether the shoulders become square to the throw.

Introducing the Throws to Beginners

TEACHING THE SHOT PUT

The difference in technique training between beginners and experienced throwers is substantial. Advanced throwers should use the preseason to refine weak aspects of their technique and reinforce sound fundamentals.

Beginning throwers need to learn the basics of throwing the shot. A simple teaching progression follows. Each step should be mastered before the next step is undertaken.

- The beginning thrower first needs to learn the proper manner in which to hold the shot. The shot should be balanced on the hand between the fingers and the palm.
- The athlete stands in the shot ring facing the throwing area with the toes of both feet touching the toeboard. The thrower places the shot under the jaw with the elbow up away from the body. Many young throwers will let the shot fall into their palm when they try to place it under their jaw. It is important to correct this flaw immediately. The athlete then pushes the shot straight out from the body into the landing area.
- After the athlete is comfortable releasing the shot, the thrower repeats the same steps, but this time before he or she throws, the athlete twists 90-degrees at the waist in the direction of the throwing arm, so the upper body will unwind to gain momentum.
- The same steps are repeated, but this time the legs should bend as the trunk is twisted in the direction of the throwing arm. As the thrower initiates the turn of the trunk back toward the landing area to begin the throw, the legs should straighten up to produce lift on the shot.

- Once this step is mastered, the thrower should take one step back with the right foot. As he or she steps back the right foot will turn 90-degrees from the landing area. The athlete then pivots the right foot toward the landing area and twists at the waist to perform a regular stand-throw.
- From this point, the throwing drills described later can be used to develop either the glide or the spin techniques.

TEACHING THE DISCUS THROW

- Have the athlete place the discus in the palm of his or her non-throwing hand with the arm extended chest high. Have the athlete place the throwing hand flat on top of the discuss and slide it forward until the last joint of each of the four fingers slides over the edge and grips the discus. The fingers should be spread apart with the thumb on top of the discus for control (see Fig. 15-30).
- To teach the proper release of the discus, have the thrower hold the discus with the throwing arm at his or her side and the palm facing the leg. Using a bowling action, have the thrower release the discus on its edge, so it will roll along the ground. The thrower should feel the discus roll off each finger. This movement is similar to the release of the throw. Make sure that the thrower keeps the arm straight and does not cock, bend, or flex the wrist upon releasing the discus (see Fig. 15-31).
- Throwing the discus straight up in the air for height also helps teach the proper release of the discus. In this drill, the thrower stands with the feet shoulder-width apart and begins by tossing the discus a few feet overhead. Emphasize keeping the arm and wrist absolutely straight, with the discus retaining a vertical position as it is released. As skill in handling the discus improves, have the thrower toss it higher, bending the wrist and knees to generate more power for throwing (see Fig. 15-32).

GRIPPING THE DISCUS

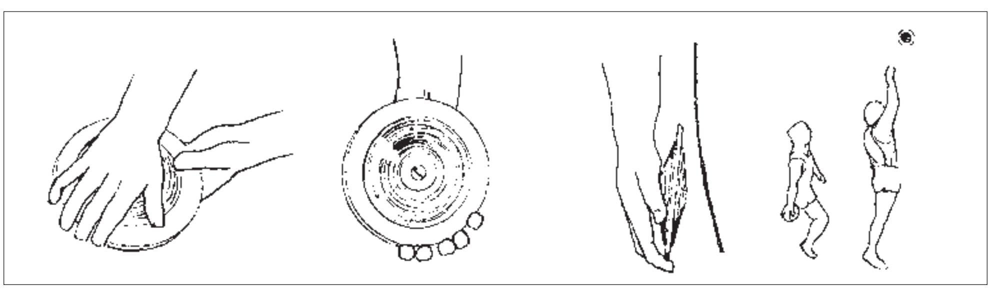

Fig. 15-30. Fig. 15-31. Fig. 15-32.

- The next step in the learning sequence is to demonstrate throwing the discus from a standing position at the front of the circle. The athlete should stand at a 90-degree angle from the landing area with the throwing arm facing the rear of the ring. The left foot should be near the front of the ring and the toes of the left foot lined up with heel of the right foot so there is a slightly opened stance. The discus should be wound back, taking care not to **cup** the discus. Only the upper body should be used to throw the discus at this stage. Concentrate on a proper release.
- Once the proper release is mastered, a full stand-throw can be attempted. The stand-throw position for the discus is very similar to that of the shot put except the throwing arm is relaxed, extended and wound back so the discus aligns over the left heel. (see Fig. 15-11). Stand-throws should be done without a reverse until proper timing is achieved.
- After the stand-throw becomes comfortable, the "half-turn" drill should be used to give the thrower a sense of pivoting on the right foot and throwing. This drill begins with the right foot placed in the middle of the discus ring with the left foot at the back of the circle and the thrower facing the front of the ring. The thrower then pivots 180-degrees on the ball of the right foot ending in the stand-throw position. Once this position is reached, the athlete throws. Pay special attention to completing the drill as one movement.
- The "step-in" drill begins with the athlete standing just outside the back of the ring facing the landing area. The thrower's left foot is placed just inside the back of the ring. The thrower then steps with the right foot into the middle of the ring. Once the right foot touches down, the rest of the drill follows the pattern of the half-turn drill. Again, this drill should not be done in parts but, rather, as one movement.
- The "South African" drill is basically the same as the step-in drill, except there is a stronger push off the left foot in the back of the ring, so a little more speed is generated when traveling across the ring. This drill simulates the action of the full throw without the first 90-degree turn at the back of the ring.
- The "360-degree turn" drill should be used to introduce the 180-degree turn out of the back of the ring. This particular drill can be done either in or out of the ring and involves a 360-degree pivot on the ball of the left foot. During this drill, the shoulders should remain parallel, and the right leg should remaiin straight, sweeping out away from the body to help the athlete maintain balance.

When this sequence of drills can be performed successfully, a full throw should be attempted.

The Equipment

Throwing equipment, particularly the discus, is a source of great debate. Does a school need to spend $300 for one boy's discus? Will a $300 discus really fly significantly farther than a $60 model? The answer is that the beginning to average high school athlete will not see longer throws with a more expensive discus; however, an elite high school thrower will see greater distance with the better discus. Each school will formulate its own policy, but a general guideline to follow might be to not buy a more expensive discus for a thrower until a male athlete has thrown consistently more than 160' or a female athlete has thrown more than 120'.

Discuses are rated (and often priced) according to their rim weight, that is, the percentage of the total weight of the implement that is located on the outer ring of the discus. Too much rim weight (generally over 82%) will be very difficult for a beginning athlete to release smoothly. A more important characteristic when looking at discuses is the durability of the plates. Discuses have to survive years of high school abuse, and the part that fails most often is the plate.

Stainless steel shots are nice but come with a hefty price and some athletes actually find them too slippery. Cast iron or turned iron shots are perfectly fine for the vast majority of throwers.

Occasionally, a coach may have an athlete with small hands who feels the iron and stainless shots are too big. For these small athletes a coach might consider a brass shot which has a smaller diameter. Brass shots are not recommended for most throwers as their smaller size puts more pressure in a smaller spot on the hand (smaller diameter = more PSI) and can lead to pain in the throwing hand.

However, each school should check the rules for its section and state regarding both the size and type of shot allowed. In some cases, the governing body may provide a shot for championship competition and not allow personal shots. This is important if an athlete uses a smaller brass shot all year and then is required to throw a larger shot in section or state competition.

Emotionally, an athlete may feel better about throwing expensive equipment and believe that it will go farther, but if the expensive implement is flying farther for the average athlete, it has more to do with the faith and comfort in the implement than the implement itself.

Many shot putters like to use chalk (magnesium carbonate) to help them achieve a good grip on their implement. In the discus, it is critically important the implement and the athlete's hands stay dry. Keep towels handy to keep the implements clean and dry during meets and practices.

Methods of Training

WEIGHT TRAINING AND CONDITIONING

Both beginners and more advanced throwers can use a similar approach to general conditioning and weight training, although intensity will differ.

Weight training should concentrate on five basic lifts. First are the Olympic lifts (clean, jerk, and snatch), which are the most important — and most neglected by American high school coaches. The Olympic lifts are extremely important in building explosive strength in the athlete. The lifts are too often ignored in favor of the power lifts, which don't do much for explosion. The power clean and snatch simulate aspects of the throws, requiring upper and lower body coordination. If a thrower has to pick just one lift to do, it should be the snatch because it conditions the total body and develops explosiveness. Second are the power lifts (bench press and squat). Other supplementary lifts can be added to condition specific body parts, but these five core lifts should take precedence.

Conditioning should also include running, plyometrics and medicine ball drills. Hill runs or sprint repeats should be part of general conditioning. The plyometric exercises can be found in Chapter 5.

The intensity of conditioning and weight training should be geared to the fitness level of the athlete. Higher volume should be done early in the season and reduced as the competitive season begins. Proper conditioning enhances performance and reduces the risk of injury. When the thrower gains strength, he or she will find that good technique will be easier along with greater control.

More advanced explanations of lifting techniques and workouts are included in the strength training chapter of this manual.

COACHING GROUPS OF THROWERS

It may be a daunting proposition to have to teach 30 or more throwers of widely varying ability levels at the same time. This problem is compounded by the fact that most schools only have one or two rings for practice.

Throws coaches must be creative in their use of space and time. The key to coaching a large number of throwers is the use of stations or areas where athletes can practice a specific skill or drill. The more throwers a team has, the more stations that are needed.

There can be stations for all the different drills including footwork, balance, release points and position work. If there are six athletes per station, three athletes can drill and three can be "teaching" and looking for cues. The activities at each station should be short and simple in order to keep the athlete's attention focused on the task at hand.

It is important that the coach continue to move around to as many stations and groups as possible; however, the coach must always be near and diligently supervising the areas where throwing is taking place.

For the shot put, if there is a very large field, the throwers can spread out with partners and warm-up by throwing back and forth to one another. There has to be at least 35 feet between pairs and the athletes should be at least 30 feet apart depending on how far they throw.

If there is a smaller group of shot putters (<10 athletes) with a large field, athletes can spread out in a line (10 feet apart) and all throw in the same direction.

With groups, the discus flies too far and too unpredictably to be safely thrown by more than one person at a time. This is where throwing rubber training balls in handball courts can be a great training idea. Generally, handball courts provide a level, clean throwing surface to on which to drill and a nice wall against which to throw.

DRILLS FOR THE SHOT PUT

The Overhead. While standing on the toeboard with the back to the throwing area, the athlete squats and throws the shot with two hands, back over the head. This drill is designed as a prelude to throwing. (Also, the forward two-handed shot toss.)

Stand-Throw. (Reverse/Non-Reverse) The stand-throw is an integral part of the warm-up for the shot. The stand-throw is the last half of the full throwing motion. The basics of the stand-throw must be mastered before the full technique is attempted. This drill should be performed without the reverse. This helps to avoid shifting the body weight onto the left leg too soon.

Stand-Throw From a Stretch. Start in the stand-throw position with a very wide base. Then, pull the right leg in underneath the body and perform the throw. This drill develops an **active** right leg by forcing the leg to push from the ground immediately after it is pulled underneath the body. Throwing from a stretch also develops leg action for gliders.

Double-Pivot Non-Reverse Throws. The double-pivot non-reverse can be used at the finish of either the stand-throw or a full throw. The purpose of this drill is to avoid the premature shift of weight onto the block leg. This error is otherwise known as **lunging**. Body weight must remain on the right leg as both feet pivot throughout the throw. The power produced from this type of throwing is generated by the rotation of the hips and body around the block leg and the extension of the right leg.

Step-Overs. These can be performed from either a stand or a full glide. This drill works on the concept of **chasing** the shot and establishing a long pull. The thrower who has a hard time shifting his or her body weight forward should use this drill. It involves stepping over the toeboard with the right leg while releasing the shot. The aim is to get as much body weight behind the shot as possible.

Right Leg Hop Drills. While holding the left foot with the left hand, the athlete pushes backward off the right foot and lands with the toes pointing 90-degrees to the left. This drill isolates the right leg drive out of the back of the ring for the glide technique.

Medicine Ball Drill for Left Leg Drive. A medicine ball is placed at the front of the shot ring. The athlete should drive the left foot backwards and kick at the medicine ball. This drill isolates the left leg drive in the glide technique.

Towel Drill. This drill works on keeping the shoulders closed as the athlete drives across the shot ring. The athlete stands in the back of the ring in a position that simulates the athlete is ready to begin a full throw. The right handed thrower holds on to a towel with his or her left hand. Another person stands behind the ring and holds the other end of the towel or the towel can be tied to a fence or a pole. The thrower then drives across the ring while holding on to the towel.

Another towel drill can be used to work on a lazy right foot out of the back. A towel is placed behind the right foot at a distance of a few inches to assure that the right leg is being driven and pulled instead of dragged across the ring.

Half-Turns for Spinners. This drill starts with the athlete facing the toeboard with the pivot foot placed in the center of the ring. The right foot pivots, and the left foot swings around so the athlete comes to the stand-throw position. Then the shot is thrown. This drill can be done in two parts or at a faster pace so one smooth movement is attained. The half-turn is the first drill that the athletes using the spin should do to learn pivotting with the shot underneath the chin.

Step-Ins for Spinners: The step-in begins with the thrower's left foot placed in the back of the ring and the right foot outside the ring. The thrower should have his or her weight entirely on the ball of the left foot. The right foot steps into the center of the ring, followed by a basic half-turn throw. The step-in drill eliminates the first half-turn out of the back, emphasizes pivoting the right foot and establishing a throwing rhythm for the spin technique.

360-Degree Turn at the Back of the Ring. This drill develops balance. Without the shot, the athlete stands in the back of the ring in the position to begin throwing. The athlete then pivots 360-degrees on the left foot. This movement then can be repeated with a shot. Done properly, the athlete's center of balance will remain over the ball of the left foot. Balance out of the back is essential for a good throw, and this drill isolates the balance point on the left leg.

Cone Drill. To maintain balance out of the back and generate momentum, the right leg must sweep out and around. Place a cone a few feet from the back of the ring. As the athlete pivots on the left foot, the right foot sweeps out in an attempt to touch the cone.

DRILLS FOR THE DISCUS THROW

Cone Throws. This drill is for the thrower who **scoops** the discus (e.g., dipping the throwing shoulder). The athlete does stand-throws, but instead of throwing the discus, the athlete throws a traffic cone. By throwing a cone, the thrower will be aware of where the implement is held and will pay special attention to avoid scooping. This is a drill that can be done indoors in a gym on rainy days.

Towel Drill. Place a towel across the center width of the discus ring. Have the athlete drive from the back hard enough so both feet land on the other side of the towel. This drill develops strong drive out of the back.

Taped Discus Line Drill. Tape the discus to the hand. Using the lines on the track, perform a South African drill. When doing the drill, avoid over-rotation by making sure the feet always end up on the line. Keep the discus in the proper position at all times.

180-Degree Drill. Line up with the pivot foot in the center of the discus ring and the opposite foot in the back of the ring with the discus wound back. Pivot on the right foot and bring the left foot around 180-degrees to the front of the ring into the stand-throw position. This drill is good for a thrower who has trouble pivoting.

90-Degree Turn Drill. This is an introductory drill which demonstrates the basic movements of the full discus throw. The drill begins with the thrower in the back of the ring in the normal starting position. A series of 90-degree pivots will be made involving the right foot for three turns, and then the left foot for the last two 90-degree turns until the stand-throw position is reached.

Weight Ball Throws. Small, weighted, plastic balls can be thrown into a wall from the stand-throw position. This allows a high volume of throws in a short amount of time. Certain technical flaws can be isolated easily with this drill, and corrections can be made without much difficulty.

A Periodization Plan for the Season

A coach's personal philosophy and the athletes' individual needs will determine the methods of technical training and conditioning used. It is up to each coach to implement his or her own system.

Every strength conditioning program begins slowly. As the thrower increases fitness, the number of repetitions should be decreased and the amount of weight increased. The weightlifting program should be designed so the athlete reaches peak strength just before the most competitive part of the season.

During peak competition (league, section, or state meets), the thrower should rest and back off the weights. Technical training should begin in the preseason – when throwers work on specific weaknesses. Problems should be addressed throughout the season. As important meets approach, practice should focus on timing, rhythm and the overall throw, rather than minor technical problems.

As with other events, training for the throws should be periodized over the course of the year or season. Periodization is the division of training into phases, or periods, emphasizing different goals and types of training. Periodized training frames the progress of training and skill development.

Generally, three to four weeks is the period over which athletes sustain improvement with any single type of training. After that time, training results diminish. Accordingly, different types of training need to be implemented.

In a two- to four-week training phase, primary emphasis should be given to one type of training, secondary emphasis to another, and less emphasis (maintenance training) to a third type. Within any training plan it is not recommended to have more than three quality, or hard training days per week, including competitions. The other days should consist of easy training or recovery days.

The goal of periodization is to manage the stress of training in order to produce improvement. Recovery is part of that management.

TRAINING THROWERS SYSTEMATICALLY

A system of training uses several methods and types of training within a seasonal training cycle. The following is a recommended shot put and discus throwing training plan.

	WEEKS	PRIMARY EMPHASIS	SECONDARY EMPHASIS	MAINTENANCE
Preseason	**2**	**General Training**	**Weight Training**	
	3	**Weight Training**	**Technique**	**General Training**
Early Season	**3**	**Weight Training**	**Technique**	**Plyos**
	3	**Technique Drills**	**Plyos**	**Weight Training**
Mid-Season	**2**	**Technique Drills & Throws**	**Plyos**	**Weight Training**
	2	**Technique Throws**	**Plyos**	**Weight Training**
Late Season	**2-4**	**Special Training** **Full Throws**	**Light Plyos**	**Weight Training**

SAMPLE THROWING TRAINING PLAN, APRIL 1–28

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1 **Tech Drills** **Plyometrics** **Weights** Power	**2** Warm-Up **5 x 30 Sprints** **Weights** Olympic	**3** Warm-Up **10 Easy Throws** **Strides**	**4** **Home Meet** **vs** **Sullivan HS**	**5** Rest Day	**6** **Oerter** **Relays**	**7** Rest Day
8 **Tech Drills** **Plyometrics** **Weights** Olympic	**9** Warm-Up **5 x 40 Sprints** **Tech Throws**	**10** Warm-Up **10 Easy Throws** **Easy Plyometrics**	**11** **Away Meet** **vs** **Wilkins HS**	**12** Warm-Up **Tech Drills** **Easy Weights**	**13** **O'Brien** **Invitational**	**14** Rest Day
15 **Tech Drills** **Plyometrics** **Weights**	**16** Warm-Up 2 x 120 + 80 + 40 **Throwing Drills**	**17** Warm-Up **Easy Weights**	**18** **Home Meet** **vs** **Long HS**	**19** Warm-Up **Plyometrics** **Weights**	**20** **Throws** **Strides 6 x 100**	**21** Rest Day
22 **Tech Throws** **Plyometrics**	**23** Warm-Up **6 x 30m Sprints** **Weights**	**24** Warm-Up **Easy Weights** **Easy Throws**	**25** **Away Meet** **vs** **Sylvester HS**	**26** Rest Day	**27** **Outfield** **Invitational**	**28** Rest Day

SHOT PUT AND DISCUS WORKOUT

Sequence Date:

RUNNING WARM-UP:

Pre-stretch Plus:

FLEXIBILITY/MOBILITY EXERCISES:

PLYOMETRICS:

TECHNIQUE DRILLS:

THROWS:

RUNNING AND CONDITIONING:

WEIGHT TRAINING:

NOTES:

SHOT PUT AND DISCUS WORKOUT

Sequence Date: Mon April 9

1 **RUNNING WARM-UP:**

Pre-stretch Plus: 600m

2 **FLEXIBILITY/MOBILITY EXERCISES:**

3 **PLYOMETRICS:** 2 x 30m: High Knees, Power Skips, Skipping Kicks, Single Leg hops (1x30m each leg)

4 **TECHNIQUE DRILLS:** w/Medicing Ball: 2-hand underhand, overhand, pivots, rotational throws

5 **THROWS:** Shot Put Gliders: 5x standing, 5x stop and throw, 30x full cross ring, 5x standing, 5x So. African Drill

Discus and Rotational Putters: 5x standing, 5x 360 pivot and throw, 5x So. African Drill, 30x full cross ring, 5x standing

RUNNING AND CONDITIONING:

6 **WEIGHT TRAINING:**

Upper Body Series

NOTES:

Appendix

The Rules of Competition

Officials' Instruction Sheets

FINISH LINE JUDGES AND INSPECTORS' DEFINITIONS

A **Contestant** is any athlete entered in the meet. A contestant must be in proper uniform and wear his/her assigned number when numbers are required. A contestant becomes a participant when he/she reports to the Clerk of the Course or Head Field Judge for an event. A contestant may not participate in more than four events, including relays.

A **Heat** is a preliminary race from which the fastest competitors advance to the finals or next round of trials.

A **Qualifier** is a contestant who advances to the final round of competition from a preliminary heat.

A **Section** is one or more races in the same event (held in lieu of preliminary heats and a final) in which final places are determined by the times recorded in all sections.

A **Lane** is the course which is marked on the track to indicate the prescribed path of the runner. Each lane is marked so that the left-hand lane line is outside the runner's lane, and the right-hand lane line is within the runner's lane.

A ***Lap*** is one complete counter-clockwise circuit of the track.

Staggers are the different starting lines in adjoining lanes used for events run in lanes for all or part of the race.

Alleys are a combination of two or more adjoining lanes used when three or more runners start from the same stagger.

The **Exchange Zone** is the designated area measuring 20 meters in length for exchanging the baton during relay races. The beginning and end of the zone are marked by lines extending across the width of the lane.

For relay legs of 200 meters or less, the **Acceleration Zone** is the designated area measuring 10 meters in length immediately preceding the exchange zone in which the outgoing runner may accelerate before receiving the baton. The beginning of the acceleration zone is to be indicated by a distinctive mark on the track.

Hurdling is a technique in which the competitor attempts to clear each hurdle by striding over it.

A **Relay** is a race between teams of four runners, no one of whom may run more than one **Leg** (part) of the relay.

A **Baton** is the implement which is handed from runner to runner in a relay race. A relay leg is completed when the incoming runner passes the baton to the outgoing runner.

RULES OF COMPETITION FOR TRACK EVENTS

1. THE START

a. **All races shall be started with the firing of a pistol or electronic gunless device** which provides smoke or a flash visible to the timers. A misfire does not constitute a start.

b. **The starting commands for races less than 800 meters are, "On your marks,"** (after which competitors must take proper, steady positions behind the starting line), followed by "set" (after which competitors must assume their final "set" position without any part of their body touching on or beyond the starting line). When all competitors are set and motionless, the Starter shall fire the pistol. The interval between the "set" command and firing of the gun should be 1–2 seconds.

c. **If the Starter is not satisfied that all competitors are ready and set, the starter should instruct them to "Stand up," and begin the sequence of starting commands over again.**

d. **The starting commands for individual races or opening relay legs of 800 meters or longer shall be, "On Your Marks."** When all competitors are steady, the starter shall fire the starting device.

e. **Violations which constitute a *false start* include:**

- Failure to comply with the Starter's commands.

• Having any part of the body touching or in advance of the starting line when the gun is fired.

• Failure to remain motionless after assuming the set position.

• Repeated attempts to distract opponents.

Note: A runner who commits a false start is disqualified from that event.

f. **After an unfair start, the Starter shall recall all competitors to the starting line by firing a second shot.** If, due to contact with another runner, a runner falls in the first 100 meters of a race of 400 meters or longer, the Starter shall recall all competitors to the starting line by firing a second shot.

g. **If a contestant's starting blocks are slipping,** the Starter may authorize someone to hold and support the blocks.

2. THE FINISH

a. The finish line should be marked on the track across all lanes. The inside edge of the line marks the actual finish.

3. RACES RUN IN LANES

a. **When a race is run in lanes, each competitor must remain in his or her lane for the entire distance.** A competitor who, without being fouled and while running around a curve, gains an advantage by stepping on or across the inside lane line for three or more consecutive strides with either foot, shall be disqualified .

4. RELAY RACES

a. **The baton must be carried in the hand throughout the race and handed (not thrown) to the receiving runner.**

b. **The baton must be passed within the exchange zone.** The position of the baton, not the runners, determines whether the exchange is made within the zone.

c. **The baton exchange is considered complete** when it is in the hand of the receiving runner.

d. **If the baton is dropped** outside the exchange zone, it must be retrieved by the competitor who dropped it. If the baton is dropped within the exchange zone, it may be retrieved by either competitor, even from another lane, provided neither runner interferes with an opponent and the baton is retrieved within the limits of the exchange zone extended across the track.

A baton that inadvertently leaves a runner's hand must be retrieved immediately without interference to other runners.

e. In relay races where acceleration zones are not permitted, each outgoing runner must wait for the baton from a position entirely within the exchange zone.

f. Relay infractions resulting in *disqualification*:

- Failure to pass the baton within the exchange zone
- Lane violations
- Fouling or interference
- Receiving outside coaching during an exchange
- Throwing the baton following the finish of the relay

5. HURDLE RACES

A Hurdler shall be *disqualified* if the competitor:

- Does not attempt to clear each hurdle
- Deliberately knocks down a hurdle by hand or foot
- Advances or trails a leg or foot along the side of and below the height of the hurdle
- Runs over a hurdle in another lane
- Runs around a hurdle
- Impedes another hurdler

6. ACTS WHICH SHALL RESULT IN DISQUALIFICATION FROM FURTHER PARTICIPATION IN THE MEET

a. Unsportsmanlike conduct, including:

- Unethical or dishonorable conduct
- Disrespectfully addressing an official
- Any flagrant behavior
- Intentional contact
- Taunting, criticizing or using profanity directed toward someone

This shall apply to all coaches, contestants and other team/school personnel.

b. **Interfering with a competitor,** and unfairly interrupting the competitor's normal running rhythm: This includes bumping, tripping, or running across the competitor's path. **If a non-participating team member interferes with a competitor during competition, the non-participating team member may be disqualified from the meet. The non-participant's teammate(s) may also be disqualified from that event.**

c. **Receiving assistance during competition** from a coach, teammate or anyone connected directly or indirectly with the athlete or the athlete's team. **Such assistance includes:**

- Interference with another competitor
- Pacing by a teammate or persons not competing in the event
- Competitors joining or grasping hands with each other during a race
- Competitor using an aid during the race
- Communicating with a competitor through the use of a wireless device
- Coaching a competitor from a restricted area
- A competitor views videotape prior to the completion of the competition

d. **Participating in more than four events.**

e. **Competing while wearing an illegal uniform.**

LONG JUMP RULES

DEFINITIONS

A **Trial** is an attempted jump.

A **Flight** is a group of contestants participating in a round of trials.

A **Qualifier** is a contestant who advances to the final round of competition by having one of the top marks in the trials.

A **Foul** is a jump that is counted as a trial but is not measured because of a violation of the rules.

RULES OF COMPETITION

1. **The takeoff area must be marked by a takeoff board measuring 8–24 inches wide and at least 4 feet in length** secured firmly in the runway. (On hard-surfaced runways, a painted takeoff board of contrasting color and of the same size may be used in lieu of a takeoff board.)

2. **The scratch line is the front edge of the takeoff board nearest the landing pit** and is used to mark the limit of the competitors' run-up. The boys' and girls' scratch line should be located at respective distances of approximately 12–8 feet from the landing pit.

3. **The landing pit should be filled with loose, soft sand** to a depth that ensures a safe landing and which reaches the same elevation as that of the takeoff board.

4. **No markers may be placed on the runway or in the landing pit.** However, it is permissible to place a marker at the side of the runway or landing pit.

5. **A trial shall be judged a *foul* if:**

   a. The competitor's shoe extends over the scratch line (or the scratch line extended), whether in the act of jumping or running through without jumping.

   b. In the course of landing the competitor touches the ground outside the landing pit nearer to the scratch line than the nearest mark made in the landing pit.

   c. The competitor walks back through the landing pit toward the scratch line.

d. The competitor fails to complete a trial within time allowed of being called (unless excused to compete in another event).

e. The competitor employs any form of somersault technique.

6. **League rules or the Games Committee will determine the number of trials and the number of qualifiers that shall advance to the finals.** Competitors place in the order of their best mark, whether achieved in the trials or finals. Competitors must have a legal mark in the trials to advance to the finals. Qualifiers for the finals jump in reverse order with the competitor having the best mark in the trials jumping last.

7. **Measurement of a legal jump is made by extending the measuring tape from the nearest break in the sand of the landing pit made by any part of the body perpendicularly to the scratch line or its extension.** (It is essential that the surface of the sand be smooth and level with the takeoff board for each trial.) Measurements are recorded to the nearest lesser 1⁄4 inch.

8. **Ties are broken by** awarding the higher place to the competitor with the second best mark. If the tie remains, the higher place is awarded to the competitor with the third best mark, etc.

TRIPLE JUMP RULES

DEFINITIONS

A **Trial** is an attempted jump.

A **Flight** is a group of contestants participating in a round of trials.

A **Qualifier** is a contestant who advances to the final round of competition by having one of the top marks in the trials.

A **Foul** is a jump that is counted as a trial but is not measured because of a violation of the rules.

RULES OF COMPETITION

1. **The takeoff area must be marked by a takeoff board measuring 8–24 inches wide and at least 4 feet in length,** firmly secured in the runway. (On hard-surfaced runways, a painted takeoff board of contrasting color and of the same size may be used in lieu of a takeoff board.)
2. **The scratch line is the front edge of the takeoff board nearest the landing pit,** and is used to mark the limit of the competitors' run-up. The boys' and girls' scratch lines should be located at respective distances of approximately 32 and 24 feet from the landing pit.
3. **The landing pit should be filled with loose, soft sand** to a depth that ensures a safe landing and which reaches the same elevation as that of the takeoff board.
4. **No markers may be placed on the runway or in the landing pit.** However, it is permissible to place a marker at the side of the runway or landing pit.
5. In the ***hop*** **phase,** the jumper must land on the same foot with which he or she took off. **In the subsequent *step* phase,** the jumper must land on the other foot. **In the final *jump* phase,** the jumper must take off from the step phase into a long jump landing. (**Correct sequences:** Beginning with a left leg takeoff, L-L-R-into a long jump landing. Beginning with a right leg takeoff, R-R-L into a long-jump landing.)
6. **A trial shall be judged a *foul* if:**

   a. The competitor's shoe extends over the scratch line (or the scratch line extended), whether in the act of jumping or running through without jumping.

b. In the course of landing the competitor touches the ground outside the landing pit nearer to the scratch line than the nearest mark made in the landing pit.

c. The competitor walks back through the landing pit toward the scratch line.

d. The competitor fails to complete a trial within allotted time of being called (unless excused to compete in another event).

Note: It is not a violation when a competitor's trailing leg touches the ground between phases.

7. **League rules or the Games Committee will determine the number of trials and the number of qualifiers that shall advance to the finals.** Competitors place in the order of their best mark, whether achieved in the trials or finals. Competitors must have a legal mark in the trials to advance to the finals. Qualifiers for the finals jump in reverse order with the competitor having the best mark in the trials jumping last.

8. **Measurement of a legal jump is made by extending the measuring tape from the nearest break in the sand of the landing pit made by any part of the body, perpendicularly to the scratch line or its extension.** (It is essential that the surface of the sand be smooth and level with the takeoff board for each trial.). Measurements are recorded to the nearest lesser 1⁄4 inch.

9. **Ties are broken** by awarding the higher place to the competitor with the second best mark. If the tie remains, the higher place is awarded to the competitor with the third best mark, etc.

HIGH JUMP RULES

DEFINITIONS

A **Trial** is an attempted jump.

A **Pass** is a decision by the competitor not to take any or all of the three trials permitted at a given height.

A **Flight** is a group of contestants participating in a round of trials.

A **Miss** is an unsuccessful clearance.

RULES OF COMPETITION

1. **The approach to the takeoff area** should be a level surface.
2. **The landing pad** should meet minimum NFHS standards.
3. **Hard and unyielding surfaces,** such as but not limited to concrete, wood or asphalt, that extend out from beneath the sides and back of the high jump landing pad shall be padded with a minimum of 2-inch dense foam or other suitable material.
4. **The standards** are the uprights which support the crossbar. They must be placed at least 12- feet apart and may not be moved during competition. The standards shall have all exposed projections on the base covered or padded and be secured in a way as to prevent them from tipping over.
5. **The crossbar** must be 12–14 feet 10 inches in length, square, triangular or circular in thickness, not to exceed 13⁄16 inches, and weigh not more than 5 pounds.
6. **Each competitor is allowed a maximum of three trials** at each height in the order in which names are drawn or assigned.
7. **A competitor may elect to pass a height** to jump at the next higher height or, after one or two misses, elect to take his or her remaining one or two trials at a higher height.
8. **A competitor is eliminated from further competition after three consecutive misses** at any heights. When only one competitor remains in the competition, he or she may determine the successive heights of the crossbar.
9. **Competitors are allowed to place a removable marker** at the beginning of the run-up and at the point of takeoff.

10. **Once competition has begun, no practice is permitted on the approach or takeoff area.** However, a competitor who has passed three consecutive heights may be permitted a warm-up jump without the crossbar in place.

11. **The bar may not be lowered once competition has started** except during a jump-off to break a tie for first place.

12. **The jump takeoff must be made from one foot.** No weights or artificial aids may be used.

13. **A trial shall be judged a *miss* if:**

a. The jumper displaces the crossbar in an attempt to clear it.

b. The jumper touches the ground or landing area beyond the plane of the crossbar (or the crossbar extended) without clearing the bar.

c. After clearing the bar, the jumper touches a standard, steadies the bar or displaces the crossbar.

d. The jumper fails to complete a trial within the allotted time of being called.

14. **Ties for first place only are broken by:**

a. Awarding the higher place to the competitor with the fewest trials at the height at which the tie occurs.

b. If the tie still occurs, the competitor with the fewest total number of unsuccessful trials throughout the competition, up to and including the height last cleared, shall be awarded the higher place.

c. Passed trials shall not count as misses.

d. If the tie remains after applying (a) and (b), and:

1. If it concerns first place, the competitors tying shall make one more attempt for the height at which they failed. If no decision is reached, the bar shall be lowered by one inch. If one or more of the tying competitors clear the height, the bar shall be raised by intervals of one inch. Each competitor shall attempt one trial at each height until the winner is determined.

2. If the tie concerns any place other than first place, the competitors shall be awarded the same place.

3. A competitor shall be credited with his or her best achievement if it occurs in a jump off for first place.

POLE VAULT RULES

DEFINITIONS

A **Trial** is an attempted jump.

A **Pass** is a decision by the competitor not to take any or all of the three trials permitted at a given height.

A **Flight** is a group of contestants participating in a round of trials.

A **Miss** is an unsuccessful clearance.

RULES OF COMPETITION

1. **The runway** should be a minimum of 130 feet long and 42 inches wide whenever possible.
2. **The landing pad** must meet the minimum standards outlined in the NFHS Track and Field rule book.
3. **Hard and unyielding surfaces** such as but not limited to concrete, wood or asphalt, that extend out from beneath the sides and back of the pole vault landing pad shall be padded with a minimum of 2-inch dense foam or other suitable material..
4. **The standards are the uprights which support the crossbar.** They must be placed not less than 12 feet or more than 14 feet 2 inches apart. The pins which support the crossbar must be round, _ inch in diameter, and must project no more than 3 inches at right angles from the side of the standards opposite the runway. No tape, indentations, or aids of any kind may be used to help keep the crossbar in place. The standards shall have all exposed projections on the base covered or padded and be secured in a way as to prevent them from tipping over.
5. **A competitor shall have the standards** or uprights set to position the crossbar from a point 12 inches beyond the vertical plane or the top of the stopboard, up to a maximum distance of 30 inches in the direction of the landing surface.
6. **The crossbar** must be 12–14 feet 10 inches in length; square, triangular, or circular, not more than 13⁄16 inches thick; and weigh not more than 5 pounds.

7. **A vaulting box** into which the vaulting pole is placed must be recessed into the end of the runway in front of the landing pit. The vaulting box may not contain any foreign materials. (Consult the NFHS rule book for specific dimensions.)

8. **The vaulting pole** may be of any material and of any length and diameter. It may be wrapped for gripping with not more than two layers of adhesive tape of uniform thickness. The lower end of the pole may be wrapped with sponge rubber and/or several layers of tape to protect it when planted into the vaulting box.

9. **The competitor's weight** shall be at or below the manufacturer's pole rating. The manufacturers must include on each pole: the pole rating that shall be a minimum of 3/4 inch in a contrasting color located within or above the top handhold position a 1-inch circular band indicating the maximum top handhold position with the position being determined by the manufacturer.

   A competitor shall not use a training pole, a pole which is improperly marked, or a pole rated below his/her weight during warm-up or competition.

   Penalty: Disqualification from the event. Prior to warm-up, the field event referee, head field judge or assigned inspector of implements shall inspect each pole to be used in the competition to verify that the poles are legal equipment. This includes checking the placement of a top handhold band, numerical pole ratings a minimum of 3/4 inches in a contrasting color located within or above the top handhold band, and the proper binding of not more that two layers of adhesive tape of uniform thickness. The binding shall not be on or above the top handhold.

   It is the responsibility of the coach to verify the competitor will use a legal pole rated at or above his/her weight.

10. **No competitor is allowed to use the pole of another individual** without the owner's permission.

11. **No taping of the hands or fingers** is permitted except to cover an open wound. Gloves may not be worn.

12. **Each competitor is allowed a maximum of three trials** at each height in the order in which names are drawn or assigned.

13. **A competitor may elect to pass a height** to jump at the next higher height or, after one or two misses, may elect to take his/her remaining one or two trials at a higher height.

14. A competitor is eliminated from further competition after three consecutive misses at any height. When only one competitor remains in the competition, he or she may determine the successive heights of the crossbar.

15. No mark or marker may be placed on the runway, but it is permissible to place markers on the side of the runway.

16. Once competition has begun, no practice is permitted. However, a competitor who has passed three consecutive heights may be permitted a warm-up jump without the crossbar in place.

17. The bar may not be lowered once competition has started except during a jump off of a tie for first place.

18. Any competitor may have the standards moved backward 24 inches toward the landing pit or forward 12 inches toward the runway from either side of a line through the back of the vaulting box stopboard.

19. A trial shall be judged a *miss* if:

a. The crossbar is displaced by the body or the pole from the pins on which it originally rested.

b. The vaulter leaves the ground and fails to clear the bar.

c. After clearing the bar, the vaulter touches a standard and displaces the crossbar.

d. The standards are incorrectly positioned.

e. After leaving the ground, the vaulter moves his or her lower hand above his or her upper hand or moves the upper hand higher on the pole.

f. The vaulter fails to complete a trial within the allotted time of being called.

20. It does not count as a trial if the competitor's pole breaks during an attempt.

21. An official or another competitor may catch the pole after it has been released by the competitor, if it is falling away from the crossbar and uprights.

22. A pole may pass under the crossbar without the attempt being counted as a miss.

23. Ties for first place only are broken by:

a. Awarding the higher place to the competitor with the *fewest trials* at the height at which the tie occurs.

b. If the tie still occurs, the competitor with the fewest total number of unsuccessful trials throughout the competition, up to and including the height last cleared, shall be awarded the higher place.

c. Passed trials shall not count as misses.

d. If the tie remains after applying (a) and (b), and:

1. If it concerns first place, the competitors tying shall make one more attempt for the height at which they failed. If no decision is reached, the bar shall be lowered by three inches. If one or more of the tying competitors clear the height, the bar shall be raised by intervals of three inches. Each competitor shall attempt one trial at each height until the winner is determined.

2. If the tie concerns any place other than first place, the competitors shall be awarded the same place.

3. A competitor shall be credited with his or her best achievement if it occurs in a jump off for first place.

e. If the tie still remains, *lowering the bar* by intervals of 3 inches and allowing the competitors one trial until the winner is determined.

SHOT PUT RULES

DEFINITIONS

A **Trial** is an attempted throw.

A **Flight** is a group of contestants participating in a round of trials.

A **Qualifier** is a contestant who advances to the final round of competition by having one of the top marks in the trials.

A **Foul** is a throw that is counted as a trial but is not measured because of a violation of the rules.

RULES OF COMPETITION

1. **The boys' shot must weigh 12 pounds and the girls' shot must weigh 4 kilograms.** The shot must be a smooth-surfaced solid sphere without any indentations or projecting points.
2. **The shot must be thrown from a concrete or asphalt circle 7 feet in diameter and land within a sector** marked on the ground by lines extending from the center of the circle to the outside edges of the stopboard into the landing sector. The width of the sector is stated in the NFHS rule book.
3. **The circumference of the circle must be marked by a steel or plastic band** 6mm in thickness or by a painted line.
4. **An arc-shaped stopboard measuring 4-ft. long, 4-inches high and 4-inches wide** must be firmly secured to the front half of the circle so its inside edge coincides with the inside edge of the circle.
5. **A legal put must be made from the shoulder with one hand only.** During the attempt the shot may not drop below or behind the shoulder.
6. **Taping the wrist, palm, or back of the hand is permitted, as is taping not more than two adjoining fingers tightly together.** There can be no connecting tape between the fingers and the palm, wrist, or back of the hand, or between the wrist and the palm or back of the hand. Gloves are not permitted, but competitors may apply a suitable substance to the hand to improve gripping the shot. No such substance may be applied to the surface of the circle or the competitors' shoes. Competitors may wear a leather belt to protect the spine from injury.

7. A trial is judged a *foul* if:

a. A throw lands on *or outside* one of the sector lines.

b. After entering the circle, the competitor *fails to pause* before starting the throw.

c. The competitor *touches outside* the inside edge of the circumference of the throwing circle or stopboard.

d. The competitor *leaves the circle* before the shot has landed and the judge calls "mark" or, after completing the throw, *fails to exit under control through the back half* of the circle.

e. The competitor *fails to complete a trial* within the allotted time of being called.

8. A competitor may interrupt a trial once started and begin again provided no infraction of the rules has been committed.

9. A throw is measured by extending the measuring tape from the nearest edge of the first mark made by the shot to the center of the circle. The measurement is taken at the point where the tape touches the inside edge of the stopboard to the nearest lesser _ inch.

10. League rules or the Games Committee will determine the number of trials and the number of qualifiers that shall advance to the finals. Competitors place in the order of their best mark, whether achieved in the trials or finals. Competitors must have a legal mark in the trials to advance to the finals. Qualifiers for the finals throw in reverse order with the competitor having the best mark in the trials throwing last.

11. Following a completed attempt, the shot must be carried back to the circle and never thrown or rolled back.

DISCUS RULES

DEFINITIONS

A **Trial** is an attempted throw.

A **Flight** is a group of contestants participating in a round of trials.

A **Qualifier** is a contestant who advances to the final round of competition by having one of the top marks in the trials.

A **Foul** is a throw that is counted as a trial but is not measured because of a violation of the rules.

RULES OF COMPETITION

1. **The boys' discus must weigh 3 pounds 9 ounces and the girls' discus must weigh 1 kilogram.** Both sides of the discus must be identical, without any indentations or rough edges.
2. **The discus must be thrown from a concrete or asphalt circle 8 feet 2_ inches (2.50 meters) in diameter inside a U-shaped enclosure or cage** to protect the safety of the officials, spectators, and competitors.
3. **The discus must land within sector marked on the ground** with lines extending from the center of the circle. The width of the sector is outlined in the NFHS rulebook.

   The circumference of the circle must be marked by a steel or plastic band 6mm in thickness or by a painted line.
4. **Competitors may not wear gloves or tape any part of the hand or fingers.** Competitors may apply a suitable substance to the hand to improve gripping the discus, but no substance may be applied to the surface of the circle or the competitors' shoes. Competitors may wear a leather belt to protect the spine from injury.
5. **It is a *foul* if:**

   a. A throw lands on *or outside* one of the sector lines.

   b. After entering the circle, the competitor *fails to pause* before starting the throw.

c. The competitor *touches outside* the inside edge of the circumference of the throwing circle.

d. The competitor *leaves the circle* before the discus has landed, and the judge has called "mark,"or after completing the throw, *fails to exit under control through the back half* of the circle

e. The competitor *fails to complete a trial* within allotted time of being called.

6. **A competitor may interrupt a trial once started and begin again,** provided no infraction of the rules has been committed.

7. **A throw is measured by extending the measuring tape from the nearest edge of the first mark made by the discus** to the center of the circle. The measurement is taken at the point where the tape touches the inside edge of the circumference of the circle and recorded to the nearest lesser inch.

8. **League rules or the Games Committee will determine the number of trials and the number of qualifiers that shall advance to the finals.** Competitors place in the order of their best mark, whether achieved in the trials or finals. Competitors must have a legal mark in the trials to advance to the finals. Qualifiers for the finals throw in reverse order with the competitor having the best mark in the trials throwing last.

9. **Following a completed attempt, the discus must be carried back to the circle** and never thrown or rolled back.

Officials' Instruction Sheets

AFFIX TO BACK OF CLERK'S CLIPBOARD

CLERK OF THE COURSE

1. **Call participants to check-in in advance of each track event.** Make any changes or corrections necessary on the entry sheets.
2. **Begin checking in athletes 10 minutes prior to the first event and try to stay three flights ahead throughout the meet.** (While one race is in progress, the next flight of participants should be ready to take their starting positions upon its completion).
3. **Check to see each runner is in legal uniform** and not in violation of any NFHS rules (and wearing a properly affixed number if required).
4. **Assign each runner to his or her proper race section, lane or position on the starting line.**
5. **Provide all necessary information to participants en masse prior to their race, including:**
   - The event which is in progress on the track and the event which proceeds their race.
   - The location near the finish line where competitors should wait to be called to the starting line.
   - The position to assume at the starting line. (Either standing in front of their blocks or two feet behind the international curve start line).
   - Where to break for the inside lane if the race is not run in lanes all the way.
   - What to do at the completion of the race. (Return to the finish line in their lanes or order of finish until dismissed by the Head Timer.)
6. **Send the entry sheet to the Head Timer prior to each event.**

AFFIX TO THE FRONT OF THE HEAD TIMER'S CLIPBOARD

HEAD TIMER / FINISH JUDGE INSTRUCTIONS

1. **Check out stopwatches for all the Timers** from the Head Coach/Meet Director.

2. **Assign timers the place that they are to pick and time in each race.** Assign the most experienced timers to the most difficult places to pick — 3rd, 4th, 5th, etc.

3. **Issue each Timer a stopwatch.**

4. **Position the Timers in direct line with the finish line.** If there is a tiered judges' stand at the finish, be sure it is placed at least five meters back from Lane 1 so that competitors in the outside lanes can be seen over those nearer the judges. **If there is no judges' stand available, divide your Timers between finish-line positions on either side of the track.**

5. **Instruct Timers to:**

   • Judge each runner's finish place by when the chest — not the head, arms or legs — crosses the finish line.

   • Identify the competitor they have timed by name or lane assignment after each race.

   • Refrain from discussing their times or place-picks until after they have been requested by the Head Timer.

6. **Notify the Starter when the Timers are ready prior to each race** by blowing a whistle or waving a colored flag.

7. **Record the competitors' finish places and times on the result sheet** as reported to you by the Timers after each race.

8. **Defer to the judgment of the Timer picking the higher place** to resolve any disputed finishes.

9. **Adjust any times as might be necessary** (e.g., if the 3rd-place time is faster than the 2nd-place time).

10. **Keep the finish line clear of non-participating athletes and spectators.**

11. **Send the result sheet to the Announcer and Scorer's table** at the completion of each event.

12. **Upon completion of the final running event, collect the stopwatches** from the Timers and return them to the Head Coach/Meet Director.

AFFIX TO THE BACK OF THE HEAD LONG JUMP JUDGE'S CLIPBOARD

HEAD LONG JUMP JUDGE INSTRUCTIONS

1. **Review the "Rules of Competition"** for the Long Jump affixed to the front of the clipboard.
2. **Determine the order of competition** for Varsity Boys, Varsity Girls, FS Boys and JV Girls from the Head Coach/Meet Director.
3. **List the competitors' first and last names and school affiliations** on your event sheet as they check-in.
4. **Allow competitors in the first flight time to measure and mark their run-up distances and take at least two practice jumps.**
5. **When you begin a flight of competition, call the contestants in groups of three,** as follows: "Johnson up, Smith on deck, Jones to follow." Record a miss if the competitor does not complete a trial within the allotted time of being called.
6. **Change the jumping order, if necessary, to allow competitors to participate in other events.** However, set a time limit for the completion of all trials.
7. **When judging a jump, position yourself at the jumper's takeoff leg side of the takeoff board.** Watch closely that the competitor's shoe does not touch beyond the scratch line at takeoff, and that no violation occurs during or after landing. Give a verbal signal of Fair or Foul after the competitor leaves the landing pit.
8. **When marking a jump, remind the Landing Judge that only "fair" jumps will be measured** and that the marking spike must be placed at the break of the sand made nearest to the takeoff board.
9. **When measuring a jump, close off the runway** by either placing a cone on the takeoff board or by standing on the run-way behind the takeoff board. Be sure the measuring tape is perpendicular to the scratch line of the takeoff board or the scratch line extended. After you have recorded the mark, do not remove the cone from the takeoff board or leave the runway until you have called the next three competitors and the pit is raked and ready for the next trial.
10. **At the completion of a flight of trials, announce the qualifiers and begin the finals immediately.**
11. **Allow enough time between levels of competition for each competitor to measure and mark his or her run-up distances and to take at least two practice jumps.**

AFFIX TO THE BACK OF THE HEAD TRIPLE JUMP JUDGE'S CLIPBOARD

HEAD TRIPLE JUMP JUDGE INSTRUCTIONS

1. **Review the "Rules of Competition"** for the Triple Jump affixed to the front of the clipboard.

2. **Determine the order of competition** for Varsity Boys, Varsity Girls, FS Boys and JV Girls from the Head Coach/Meet Director.

3. **List the competitors' first and last names and school affiliations** on your event sheet as they check in.

4. **Allow competitors in the first flight time to measure and mark their run-up distances and take at least two practice jumps.**

5. **When you begin a flight of competition, call the contestants in groups of three,** as follows: "Johnson up, Smith on deck, Jones to follow." Record a miss if the competitor does not complete a trial within the allotted time of being called.

6. **Change the jumping order, if necessary, to allow competitors to participate in other events.** However, set a time limit for the completion of all trials.

7. **When judging a jump, position yourself at the jumper's takeoff leg side of the takeoff board.** Watch closely that the competitor's shoe does not touch beyond the scratch line at takeoff, that the jumping sequence is correct into the long jump landing (L-L-R or R-R-L), and that no violation occurs during or after landing. Give a verbal signal of Fair or Foul after the competitor leaves the landing pit.

8. **When marking a jump, remind the Landing Judge that only "fair" jumps will be measured** and that the marking spike must be placed at the break of the sand made nearest to the takeoff board.

9. **When measuring a jump, close off the runway** by either placing a cone on the takeoff board or by standing on the runway behind the takeoff board. Be sure the measuring tape is perpendicular to the scratch line of the takeoff board or the scratch line extended. After you have recorded the mark, do not remove the cone from the takeoff board or leave the runway until you have called the next three competitors and the pit is raked and ready for the next trial.

10. **At the completion of a flight of trials, announce the qualifiers and begin the finals immediately.**

11. **Allow enough time between levels of competition for each competitor to measure and mark his/her run-up distances, and to take at least two practice jumps.**

HEAD HIGH JUMP JUDGE INSTRUCTIONS

1. **Review the "Rules of Competition"** for the High Jump affixed to the front of the clipboard.
2. **Determine the order of competition** for Varsity Boys, Varsity Girls, FS Boys and JV Girls, and the **starting heights** and **height progression** for each level from the Head Coach/Meet Director.
3. **List the competitors' first and last names and school affiliations** on your event sheet as they check in. Advise each competitor of the starting height for competition and enter the intended opening for each competitor on the event sheet.
4. **Allow competitors in the first flight time to measure and mark their run-up distances, takeoff points, and at least two practice jumps.**
5. **Before you begin a flight of competition, be sure all sections of the landing pit are securely fastened together. Mark the position of the base of each standard on the takeoff area with chalk or tape** so they can be reset in exactly the same position, should they be knocked over in the course of competition. Also, mark the underside and outsides of the crossbar so it can be reset in exactly the same position each time it is displaced.
6. **When you begin a flight of competition, call the contestants in groups of three,** as follows: "Johnson up, Smith on deck, Jones to follow." Record a miss if the competitor does not complete a trial within the allotted time of being called.
7. **When judging a jump, position yourself to the side of one of the standards so that you are looking down the vertical plane of the standards and crossbar and facing the jumper as he or she takes off.** (The bar-setter should stand to the side of the other standard.) Be sure that the ends of the crossbar and the landing pit are not touching the standards. Ensure that the pit will not bulge out and touch the standards upon the jumper's landing. If the jumper touches the bar, causing it to vibrate, do not steady it until you are certain it will not fall.
8. **When replacing the crossbar, be sure that it is sitting on the center of the supports and the same sides are always facing down and out.**

9. **When measuring a height, place the zero-mark of the tape on the takeoff surface and extend it upward and perpendicular to the topside of the lowest point of the crossbar.** Measurements should be recorded to the nearest lesser _ inch. **Each new height should be re-measured** (do not trust the readings on the standards), **and the bar should be measured before and after any record attempt.** (If there is any difference between those two measurements, the lower height is the official measurement.)

10. **Remember that only ties for first place are broken** using the procedure described on the rules sheet on the front of your clipboard.

11. **Allow enough time between flights of competition for each competitor to measure and mark his or her run-up distance and takeoff point and to take at least two practice jumps.**

HEAD POLE VAULT JUDGE INSTRUCTIONS

1. **Review the "Rules of Competition"** for the Pole Vault affixed to the front of the clipboard.
2. **Determine the order of competition** for Varsity and FS Boys and Girls, and the **starting heights** and **height progression** for each level, from the Head Coach/Meet Director.
3. **List the competitors' first and last names and school affiliations** on your event sheet as they check in. Advise each competitor of the starting height for his/her competition and enter the height at which they intend to open on the event sheet.
4. **Allow competitors in the first flight time to measure their run-up distances, place markers to the side of the runway, and to take at least two practice jumps.**
5. **Before you begin a flight of competition, be sure all sections of the landing pit are securely fastened together. Mark the underside and outsides of the crossbar** so it can be reset in exactly the same position each time it is displaced.
6. **When you begin a flight of competition, call the contestants in groups of three,** as follows: "Johnson up, Smith on deck, Jones to follow." Record a miss if the competitor does not complete a trial within the allotted time of being called.
7. **When judging a jump, position yourself to one side of the vaulting box so that you are looking down the vertical plane of the vault box.** The pole-catcher should stand on the other side and be instructed not to catch the pole unless it is falling away from the crossbar and standards. (You should never take the responsibility for catching the pole and inhibit your ability to observe each attempt from start to finish!) Under windy conditions, it may be difficult to judge whether the wind or the vaulter displaces the bar. Under such conditions you may position someone behind the standards to hold the crossbar in place with a spare pole until the competitor leaves the ground.
8. **When replacing the crossbar, be sure an equal portion of the bar extends beyond the supporting pins on each standard, and that the same sides of the bar are always down and facing out.**

9. **When measuring a height, place the zero mark of the tape on the takeoff surface and extend it upward and perpendicular to the topside of the lowest point of the crossbar.** Measurements should be recorded to the nearest lesser _ inch. **Each new height should be re-measured** (do not trust the readings on the standards), **and the bar should be measured before and after any record attempt.** (If there is any difference between those two measurements, the lower height is the official measurement.)

10. **Remember that only ties for first place are broken** using the procedure described on the rules sheet on the front of your clipboard.

11. **Allow enough time between flights of competition for competitors to measure run up distances, place their markers to the side of the runway, and take at least two practice jumps.**

HEAD SHOT PUT JUDGE INSTRUCTIONS

1. **Review the "Rules of Competition"** for the Shot Put affixed to the front of the clipboard.

2. **Determine the order of competition** for Varsity Boys, Varsity Girls, FS Boys and JV Girls from the Head Coach/Meet Director.

3. **List the competitors' first and last names and school affiliations** on your event sheet as they check-in.

4. **Safety is your most important consideration and it is your responsibility to protect competitors, officials and spectators by enforcing the following rules:**

   a. The landing sector must be cordoned-off with rope or pennants placed well outside the sector lines.

   b. Spectators must stand behind the throwing circle or a safe distance behind the Landing Judges and beyond the landing sector, NEVER along the sides of the landing sector!

   c. No practice throws may be taken without your supervision, or from any place other than the competition circle.

   d. No throw may be initiated until you have given the thrower a verbal OK that the landing sector is clear and the Landing Judges are ready.

   e. The shot must always be carried back to the circle during practice and competition, never thrown or rolled back.

   f. Once competition has begun, competitors are not allowed to throw any implements in any part of the event area.

   g. Contestants who do not follow these safety rules will be warned once, then disqualified from competition.

5. **When you begin a flight of competition, call the contestants in groups of three,** as follows: "Johnson up, Smith on deck, Jones to follow." **Inspect each competitor's shot when you call him/her for first trial.** Record a miss if the competitor does not complete a trial within allotted time of being called.

6. **When judging a throw, position yourself at the side of the circle from which the shot will be released** (right-handed thrower use the right side/left-handed thrower, use the left side). Watch closely for **hand fouls** as the thrower moves to the front of the circle, and for foot fouls on the top and sides of the stopboard.

7. **When marking a throw, position the Landing Judges at equal spacings across the back of the landing sector.** Remind them that a legal throw must land within, and not on, the sector lines and that the marking spike must be placed in the ground at the mark made nearest to the landing circle. The shot must be carried and dropped off to the side of the landing sector, not thrown or rolled, for pick-up by the contestant.

8. **When measuring a throw, be sure the tape is straight, not twisted, extended through the center of the circle, and read at the point it touches the inside edge of the stopboard.**

9. **At the completion of a flight of trials, announce the qualifiers and begin the finals immediately.**

10. **Allow enough time between flights of competition for each competitor to have at least two practice throws.**

AFFIX TO THE BACK OF THE HEAD DISCUS JUDGE'S CLIPBOARD

HEAD DISCUS JUDGE INSTRUCTIONS

1. **Review the "Rules of Competition"** for the Discus affixed to the front of the clipboard.

2. **Determine the order of competition** for Varsity Boys, Varsity Girls, FS Boys and JV Girls from the Head Coach/Meet Director.

3. **List the competitors' first and last names and school affiliations** on your event sheet as they check-in.

4. **Safety is your most important consideration, and it is your responsibility to protect competitors, officials, and spectators by enforcing the following rules:**

   a. The landing sector must be cordoned-off with rope or pennants placed well outside the sector lines.

   b. Spectators must stand behind the **discus cage** or a safe distance behind the Landing Judges and beyond the landing sector, NEVER along the sides of the landing sector!

   c. No practice throws may be taken without your supervision, or from any place other than the competition circle.

   d. No throw may be initiated until you have given the thrower a verbal OK that the landing sector is clear and the Landing Judges are ready.

   e. The discus must always be carried back to the circle during practice and competition — never thrown or rolled back.

   f. Once competition has begun, competitors are not allowed to throw any implements in any part of the event area.

   g. Contestants who do not follow these safety rules will be warned once, then disqualified from competition.

5. **When you begin a flight of competition, call the contestants in groups of three,** as follows: "Johnson up, Smith on deck, Jones to follow." Inspect each competitor's discus when you call him or her for their first trial. Record a miss if the competitor does not complete a trial within the allotted time of being called.

6. **When judging a throw, position yourself behind the cage at the side of the circle from which the discus will be released** (right-handed thrower, use the right side/left-handed thrower, use the left side). Watch closely for foot fouls during the turns and release.
7. **When marking a throw, position the Landing Judges at equal spacings across the back of the landing sector.** Remind them that a legal throw must land within, and not on, the sector lines and that the marking spike must be placed in the ground at the mark made nearest to the landing circle. The discus must be carried and dropped off to the side of the landing sector (not thrown or rolled) for pick-up by the contestant.
8. **When measuring a throw, be sure the tape is straight (not twisted), extended through the center of the circle, and read at the point it touches the inside edge of the circle.**
9. **At the completion of a flight of trials, announce the qualifiers and begin the finals immediately.**
10. **Allow enough time between flights of competition for each competitor to have at least two practice throws.**