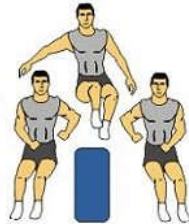


Plyometric Training



Plyometric Training

1

Readings:

- NSCA text: Chapter 17 pp 414 – 428



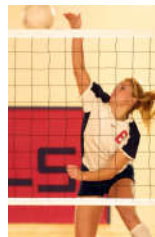
Plyometric Training

2

What are plyometrics?

Movement that involves:

1. Rapid stretch of an activated muscle (lengthening contraction, eccentric contraction)
2. Pause (Amortization phase)
3. Shortening contraction (concentric contraction) to produce the functional force outcome



Plyometric Training

3

What are plyometrics?

Movement that involves:

1. Rapid stretch of an activated muscle
2. Pause (Amortization phase)
3. Shortening contraction to produce the functional force outcome

Force (and therefore speed) that results is significantly greater than shortening contraction alone can produce

Mechanism to enhance force production is:

- Neural – discussed in KIN 410 Motor Control & Learning
- Mechanical - discussed in KIN 312 Functional Anatomy

Plyometric Training

4

What are plyometrics?

Movement that involves:

1. Rapid stretch of an activated muscle (lengthening contraction, eccentric contraction)
2. ~~Pause (Amortization phase)~~
3. Shortening contraction (concentric contraction) to produce the functional force outcome

The NSCA text makes it sound like there is an actual "PAUSE" between lengthening and shortening.

There is NO PAUSE, you shorten as soon as you can stop the lengthening

What are plyometrics?

Term **PLYOMETRICS** – common in exercise world

Synonymous with

STRETCH SHORTENING CYCLE (SSC) – common in biomechanics and motor control research world



Who should do plyometric training?

Athletes:

- Excellent way to develop quick, powerful movements & change of direction essential for sport success



Who should do plyometric training?

Non-Athletes:

- Benefits of plyometric training for non-athletes has yet to be determined.
 - As people age the decrease in power exceeds the decrease in strength observed, but powerful shortening contractions can be developed without a SSC, although power may not be maximized



Who should **NOT** do plyometric training?

- Kids < 14 yrs, Adults > 60 yrs
 - Due to high stress on immature or weakened bones
- People who have not have a basic level of resistance training achieved
 - Due to muscle strength needed for plyometrics
- Clients > 220 pounds should avoid excess plyometric intensity or quantity

Plyometric program design

Plyometric exercise design is not well developed and established as for aerobic and resistance training

Guidelines suggested are based on experience of people who have used this training modality



Plyometric program design

What are client's goals related to power and speed?

- Jump higher?
- Change direction faster?
- Hit harder (bat, club, fist, racket)?
- Throw faster?



Plyometric program design

What are client's goals related to power and speed?

- Jump higher?
- Change direction faster?
 - Different forms of **lower body** plyometrics for jumping versus change of direction



Plyometric program design

What are client's goals related to power and speed?

- Hit harder (bat, club, fist, racket)?
- Throw faster?
- Different forms of **upper body** plyometrics for hitting and throwing (but trunk and lower body plyometrics also critical for ground based arm force production)



Plyometric program design variables

1. Intensity
2. Frequency
3. Recovery
4. Volume
5. Progression



Plyometric Intensity

Intensity = amount of stress placed on tissues

All plyometric work is not high intensity and high intensity work is applicable to only high trained athletes

Low intensity	High intensity
Low skips & hops	Single leg jumps with weighted vest
Catch & toss a light ball	Catch & toss a medicine ball



Plyometric Intensity

Intensity = amount of stress placed on tissues

TABLE 17.3

Factors Affecting the Intensity of Lower Body Plyometric Drills

Factor	Methods to increase plyometric drill intensity
Points of contact	Progress from double- to single-leg support.
Speed	Increase the drill's speed of movement.
Height of the drill	Raise the body's center of gravity by increasing the height of a drill (e.g., depth jump).
Participant's weight	Add weight (in the form of weight vests, ankle weights, and wrist weights).

Plyometric Frequency

of sessions per week

- 1-3 times/wk
- To allow required 48 – 72 hour recovery between sessions



Plyometric Recovery – within the workout

Complete recovery between sets is required, you must have excellent coordination and technique when doing plyometrics
 e.g., 2-3 min between sets (1:5 to 1:10 work:rest ratio)

Recovery between **reps** is required for some very high intensity exercises

Plyometric Volume

Quantified in:

- Reps & sets
 - Throws
 - Foot contacts (for jumps)
 - Distance (for skipping & bounding)



Plyometric Volume

Sample Plyometric Volumes (but intensity is not factored into this table)

TABLE 17.4
General Plyometric Volume Guidelines
 Based on Age and Experience

Age	No resistance training experience	More than 3 months general resistance training experience	More than 3 months resistance training experience, including power exercises	More than 3 year general resistance training experience	More than 1 year resistance training experience, including power exercises	Resistance training but no plyometric training experience	Resistance training and plyometric training more than 1 year ago	Resistance training and plyometric training within past year
≤13	Nr*	Nr	Nr	Nr	Nr	Nr	Nr	Nr
14-17	Nr	40-60	40-60	60-80	80-100	40-60	60-80	80-100
18-30	Nr	60-80	60-80	80-100	100-120	80-100	100-120	120-140
31-40	Nr	40-60	60-80	60-80	80-100	60-80	80-100	100-120
41-60	Nr	40-60	40-60	60-80	60-80	40-60	60-80	80-100

Note: Volume is expressed as number of foot contacts (lower body plyometrics) or throws and catches (upper body plyometrics). Beginning plyometric training volume may be based on a variety of factors. The volumes included in this table may be modified according to individual client goals and abilities.
 *nr = not recommended (i.e., no plyometric training for a client in this situation).

Plyometric Safety

Adequate **speed** is needed

Speed requirements for athletes and high intensity drills suggested in text

Non-athletes

- use low volume of low intensity exercises



Plyometric Safety

Adequate **balance** is needed

Tests of balance that must be passed (30 sec) to do lower body plyometrics of that level, and that # leg contacts e.g. to be able to do beginner unilateral leg drills, you must be able to stand on one leg for 30 secs

TABLE 17.6

Level*	Position**	Drill variation***
Beginning	Standing	Double leg Single leg
Intermediate	Quarter-squat	Double leg Single leg
Advanced	Half-squat	Double leg Single leg

*Each of these levels corresponds with a drill's intensity level (e.g., beginning-level balance corresponds with low-intensity plyometric drills).
**The client is required to maintain each position with each variation for 30 seconds before attempting plyometric exercises of the same intensity and the more difficult balance test.
***The type of balance test (i.e., how many legs are used) needs to match the intended type of plyometric drill (e.g., the beginning client has to pass the standing single-leg balance test to qualify to perform single-leg plyometric drills).

To do double legged beginner plyometric hops, you must be able to stand on 2 legs for 30 sec?

Plyometric Equipment

Landing Surface

Adequate shock absorbing properties

- Grass, suspended floor, rubber mats etc.
- Not: hardwood or tile floors

Training Area

Lots of open space to move, throw (and possibly fall) safely

Don't do it right next to equipment

Equipment

Non-slip box tops

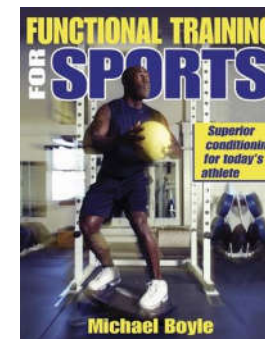
Footwear

Good support (NOT narrow, light running shoes)



Plyometric Training

Viewpoints from experts



Plyometric Training

Viewpoints from experts



Like many current issues in functional training, plyometric training can be controversial. Many experts caution against the initiation of a plyometric program for athletes who do not have the proper leg strength. Articles on plyometric training often suggest that an athlete needs to squat a weight equal to two times his or her body weight prior to even commencing a plyometric program. This is a ridiculous guideline that eliminates nearly 90 percent of the athletes who have ever trained at our facility. The two-times-body-weight guideline was actually suggested years ago as a guideline to begin high-level plyometrics but somewhere along the line was incorrectly applied to all plyometric training. Other authors suggest an eight-week strength phase before commencing a plyometric program. Although this suggestion is slightly more rational, it is still not practical because most athletes train for only 10 to 12 weeks in the off-season. An eight-week strength phase leaves only four weeks of plyometric training at most, a period far too short in which to implement a periodized program.

The keys to a plyometric program are that the exercises are taught in a progressive manner and that progress is based on competence, not a predetermined timeline. If an athlete cannot move beyond phase 1 skills, that athlete should stay in phase 1 for an additional two or three weeks before attempting to progress. Don't try to force adaptation.

Plyometric Training

Viewpoints from experts

Ed McNeely, (2007) **Introduction to Plyometrics: Converting Strength to Power**, NSCA Performance Training Journal, 6(5), 19-22.

“Having a good strength base is essential for performing plyometrics safely and effectively. Without good lower body and core strength, the amortization phase becomes too long and much of the benefit of the plyometric is lost. Over the years, the need to squat one to two times body weight has been suggested as a requirement for plyometrics. **While this is a good guideline for some of the higher intensity drills, simple jumps in place and hops over very low barriers can be used with most athletes as long as they have demonstrated the ability to land properly.**”

Plyometric Training

Viewpoints from experts

Plyometric participation standards (7 min)

(Source: [Strength and Power Hour](#), 09-08-02)



Plyometric volume and power (4 min) (Source:

[Strength and Power Hour](#), 09-08-02)

