CLASSIFYING SPRINT TRAINING METHODS

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Although opinions vary with respect to the best way to improve sprinting performance, it is universally accepted that if you want to be a good sprinter you had better include some form of running in your training programme! The interesting thing about running is that it is a very flexible training modality. There are literally hundreds of different ways you can vary the parameters involved to improve various performance characteristics. It is amazing that something so simple and natural can at the same time become so complex.

From a coaching perspective it is important to be able to label and classify sessions so you can track your athlete's progress as they develop.

Running methods can be classified with respect to the primary energy system used to fuel the reps. Therefore, methods can be describe as being alactic (meaning it does not create lactate), anaerobic (meaning they do create lactate) or aerobic in nature.

While the alactic, anaerobic and aerobic systems are all working all of the time, the type of fuel primarily used by the body during a running session is dependant on a number of factor, the most important being the rate at which fuel is needed, which is primarily dictated by the intensity and duration of the run and also the rest between reps.

PART 1: INITIAL CONSIDERATIONS

Intensity VS Effort

The term 'intensity' is one of the most misused in speed training because it is often confused with 'perceived effort'. Intensity relates to the power output (in this case the speed) of the athlete (something that can be objectively measured), whereas perceived effort refers to an individual's perception of the how hard they are working or the level of discomfort during or immediately after exercise (which can only be subjectively measured). To ensure training methods are described objectively it is essential that intensity and not effort is used to distinguish between various types of work.

Intensity can be evaluated relative to absolute levels and also relative to the individual athlete's capabilities. 'Absolute intensity' describes intensity in relation to absolute human performance. For example a time of 10.00s over the 100m represents a performance at a higher absolute intensity than a time of 12.00s. In sprinting, absolute intensity is also linked to the velocity reached during the race so by default 100m races tend to be of a higher absolute intensity than 400m races because the top speed reached will be higher. Remember even though the 400m is a 'harder' event in terms of effort the absolute intensity is lower – and this is an important concept to get to grips with.

'Relative intensity', on the other hand, relates to the individual's personal best or current potential maximum performance. Under these conditions an athlete's current season or personal best is considered 100% relative intensity. Hence, when an athlete capable of running ten seconds for the 100m takes twenty seconds to cover the same distance the run was performed at 50% intensity.

An easy way to calculate the relative intensity of a run is to divide the athletes 100% performance by the percentage you want them to be running at. So 90% (0.90) intensity for an 11.00s runner will be 11/0.90 = 12.22s, 80% (0.8) will be 11/0.8 = 13.75 and so on.

The Effect of Intensity on Recovery

Intensity has a significant impact upon recovery. The higher the intensity of the run the longer the time required to fully recover both between runs and between sessions. The time taken for an athlete to achieve full recovery between training runs is highly individual and may vary from 3 to 45 minutes depending on the absolute intensity reached. **In the sprints, as a practical guide, a coach can gauge when an athlete is fully recovered if the next run can be performed in the same or faster time and with the same level of perceived effort. If the athlete is unable to reproduce the previous performance then the rest generally needs to be extended.**

Since, total relaxation is a prerequisite for high absolute intensities (fast times), high intensity runs will have a low perceived effort by definition (think of Usain Bolt's World Record run at the Beijing Olympics as an example). However, just because high intensity efforts look 'easy' the coach should not underestimate their impact upon the athlete. Observation by the coaches of several world record holders in the 100m suggest it can take up to two weeks for an athlete to fully recover from such a feat.

Unlike other forms of training the effect of high intensity work is not immediately apparent but instead is delayed, sometimes by several days – in a similar fashion to the way DOMs (Delayed Onset Muscle Soreness) kicks in a day or more after the exercise that stimulated it.

The fatigue that occurs as a result of high intensity work cannot be attributed to the build up of lactate, hydrogen ions or other metabolites, due to the fact that very short high intensity workloads seem to induce it. Instead it is hypothesised to be the result of the loss of the fine co-ordination required to recruit large numbers of muscle fibres simultaneously and in the desired order. Therefore, it is often described as 'neural' or 'Central Nervous System' (CNS) fatigue. CNS fatigue is not always noticeable during normal everyday activities but instead manifests itself during high intensity exercise, where it results in a reduction in performance. **Empirical evidence suggests that the fatigue that accompanies high intensity sprint work takes at least 48 hours to diminish. Therefore, a coach should think long and hard before scheduling high intensity sessions on consecutive days.**

As previously covered in our discussion of the effect and intensity on fine motor skills, as intensity varies so too do the biomechanics of running. In respect to absolute intensity, the biomechanics of an athlete running a world record in the 100m (high power output) are quite different to those of an athlete running a world record in the marathon (lower but sustained power output). Furthermore, as an individual shifts between runs at varying relative intensities their biomechanics will also change. For example there is considerably more variation in vertical displacement of the athlete's centre of mass during runs at lower intensities. Looking back at the Beijing Olympics Usain Bolt's biomechanics were very different during his first round run of 10.20 when compared to his blistering world record final.

Motor learning research tells us that for positive reinforcement of the technique to occur, the biomechanics used in practice must closely resemble those used in competition. Therefore, to improve the timing of the muscle firing patterns (inter-muscular co-ordination) experienced during competition a sprinter must practice running at close to race pace – or 100% relative intensity over the desired distance.

Research and empirical evidence suggests than when an athlete drops below 95% relative intensity there is little positive reinforcement of race specific mechanics. Using the calculation explained earlier, this suggest that an athlete aiming to run 100m in 11.00s would need to run at least 11.60s to gain positive effects in terms refining the specific mechanics required to push their performance below 11s. However, if you are to spend time training at high intensity you must make sure you respect the increased recovery requirements and the principle of perfect practice such work brings with it. In short, you cannot run fast all the time and expect improved performance without injury. Instead you must be selective about your use of such work but this is a topic better addressed in conjunction with discussion on the organisation of training.

PART 2: THE CLASSIFICATION OF TRAINING METHODS

Over the years sprint coaches have developed a special vocabulary to describe the characteristics of runs of varying durations and intensities. The terms used in this article are found predominantly in literature from the soviet sporting nations. Although not universally implemented by all coaches the following descriptions provide a good terminological basis from which to discuss sprint training and will form the basis of definitions used in the UKA Coaching Qualifications. They have also been specifically chosen to align with definitions used in the UKA Exercise Classification Hierarchy and other areas of the training literature – specifically that surrounding strength training.

Due to the link between biomechanics and intensity, work in the intensity zone of 95-100% plays a significant role in a sprinter's programs. Work of this intensity bracket is collectively referred to as 'high intensity' and can be sub classified as Speed, Speed Endurance, Specific Endurance and Special Endurance. For sprinters competing in distances from 60-400m this high intensity work is classified under Competitive Exercises in the UKA Exercise Classification Hierarchy.

For more details see the Exercise Classification Hierarchy Document and Podcast on uCoach:

→ http://coaching.uka.org.uk/document/uka-exercise-classification-hierarchy-v1.0-document/
→ http://coaching.uka.org.uk/audio/exercise-classification-hierarchy-podcast/

Competitive Exercises: High Intensity Training

The UKA Exercise Classification Hierarchy (ECH), was developed to help coaches to organise their training by placing all activities into one of four categories depending on the degree to which an exercise transfers to the event being trained for.

Within the ECH, the term 'Competitive Exercises' (CE) refers to exercises they are almost identical to what happens in a race in terms of the mechanics that are used to execute them. In sprinting the CE category includes all the forms of sprinting that take place at near maximal intensity – e.g. Speed, Speed Endurance, Specific Endurance and Special Endurance work.

SPEED WORK

The term 'Speed work' describes runs of near maximal intensity (95-100%) carried out under alactic conditions, that is under conditions where lactic acid levels in the muscles are minimal and ATP-CP (also known as the phosphagen system) is the key energy system being utilised to power activity. As a rule of thumb, runs of near maximal intensity will remain alactic if they do not exceed around seven seconds in duration and if full recovery is permitted between consecutive runs. To ensure the athlete learns to run with perfect technique, when perceived effort increases a speed session should be ended or poor practice will be reinforced.

When considering what is and what isn't speed work for your athlete, it is important to note that an athlete's performance level plays a big part in determining what can be achieved via alactic means. Highly qualified (e.g. international) athletes will be able to run further before the run stops being alactic and consequently can use longer distances than novices. However, the higher absolute intensity will require them to take longer rest breaks between runs if they wish to reproduce their previous performance (because they have activated more muscle mass to achieve the higher performance).

Defining Full Recovery

For the record, 'full recovery' in the context of inter rep or set rest means a rest interval that is long enough for the athlete to be capable of performing the next repetition in the same time or faster than the last. While research shows that ATP-CP is fully restored by the body in around three minutes common sense tells us that an athlete is not necessarily fully recovered from a seven second effort (say a 60m race) in three minutes, so the coach must exercise their best judgement as to what is an appropriate 'full recovery' for a run of a given distance at high intensity. As a rule of thumb, for every second spent sprinting the athlete should rest one to two minutes in order to fully recover. So a five second effort will usually requires between five to ten minutes rest. Within this range, ten minutes would be more appropriate for elite athletes, while younger developing athletes may be able to use less than five.

Types of Speed Work

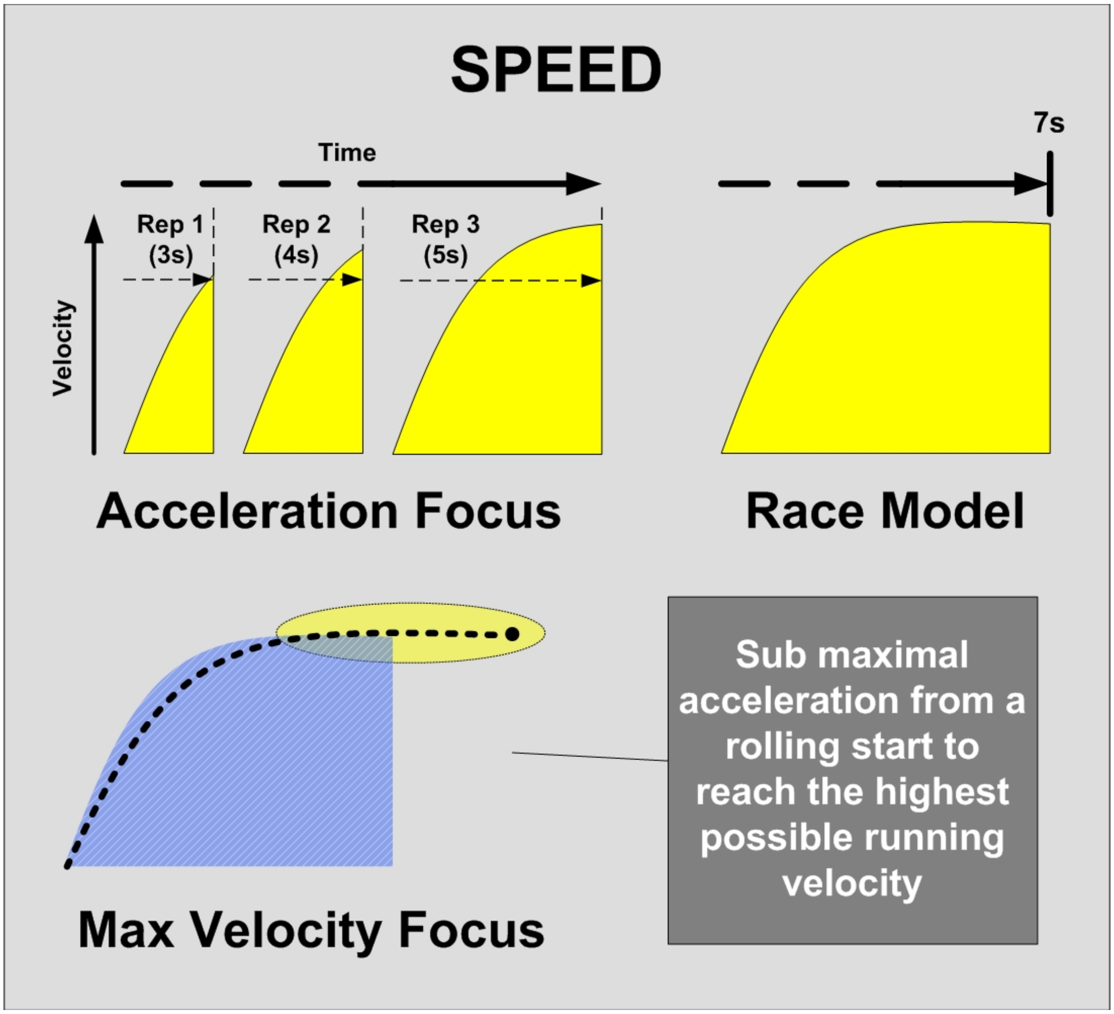
Since speed work encompasses alactic high intensity activity it incorporates both technical work for acceleration and for maximum velocity mechanics. Hence, there are essentially three kinds of sessions that fall under the 'speed' category:

- Short acceleration runs (acceleration focus)
- Flying runs (maximum velocity focus)
- Runs from a stationary start over varying distances where the total duration of the run is 7s or less (race modelling focus – where the aim is to practice the first part of the event)

The aim of work of this nature is to perfect acceleration and top speed mechanics while expanding an athlete's ability to perform work under alactic conditions (that is work predominantly fuelled by ATP-CP).

This last point about expanding an athlete's alactic capacity is an important concept in the sprints. Most coaches are familiar with the idea of improving an athlete's anaerobic capacity and ability to deal with the build up of lactic acid within the muscles, often described as developing an athlete's 'lactic tolerance'. Lactic tolerance is easy for a coach to assess because you can see a huge difference between an athlete that is used to lactic work compared to those who are not. The key changes after training for 'lactic tolerance' will be a longer time until the athlete is severely affected by the accumulation of lactic and reduced perceived effort during anaerobic training sessions. The same concept also applies to the development of 'alactic capacity', where an athlete who is used to speed work will find they can do more volume of speed work before the effects of lactic begin to be felt (and the session has to be drawn to a close) and also will have less perceived effort during short duration runs – only that now the changes are more subtle.

While for the purposes of definition we suggest that runs will cease to be alactic after seven seconds, in reality there is variation between individuals and for a beginner athlete the changes may in fact begin at six seconds. If through training over several years we were then able to shift this alactic window from 6 to 7.5 seconds that would represent a huge performance improvement over the 100m because they can now run for 1.5 seconds longer before they ever experience any perception of lactic acid and the event barely lasts more than ten seconds for mature adult competitors.



Speed Work: Acceleration Focus

Speed work that focuses on acceleration is usually performed from blocks, crouched, three point or a standing start and aims to reproduce the acceleration mechanics used in a race. The distances used will vary depending on the level of the athlete as young athletes reach lower top speeds and hence finish accelerating earlier than adults. So whereas an acceleration focus for Usain Bolt may be 40-50m, for a young athlete it may only be 10-20m. Full recovery is required between each run, so that the athlete is able to perform each repetition without a drop off in performance. Again, this will mean longer recoveries are required for more qualified athletes who are reaching higher absolute intensities than for younger developmental athletes. Therefore, rest intervals can vary from perhaps 1-2 min for youngsters to as much as 7 minutes for mature elite competitors.

So for a young athlete a typical acceleration session might be runs over 20m from a crouched start with two minutes rest between each repetition. For an elite athlete they may be sprints over 40m from blocks with a seven minute rest break.

Speed Work: Maximum Velocity

When maximum velocity is the focus, the key is to reach as high a velocity as possible and then continue the run for only as long as velocity does not decrease. Biomechanically the emphasis is on high speed upright running mechanics. Maximum velocity runs will often be performed from a rolling (jog in) start. Such a method reduces the rate of acceleration but may also allow an athlete to reach either a higher maximum velocity or the same velocity as from a stand but using less energy. The run up distance is dependant upon the distance an athlete needs to achieve their highest speeds, so for youngsters this distance will be less than for elite adults. Having finished accelerating athletes can hold their top speed for only around 10-30m. Again, younger athletes can hold top speed for much shorter distances than elite adults and so this distance will probably be only around 10m for developing athletes while for adult elite athletes this may be up to 30m.

So for a young athlete a typical maximum velocity session might use a build up of 20m from a rolling start followed by 10m flying run between two cones. Because the top speed is fairly low the rest between runs may be only four minutes. In comparison an elite competitor might use a 40m build up into a 30m flying zone. Because the speeds reached may be in excess of 12m/s the rest interval may need to be as long as 15 minutes before they can reproduce the performance again.

Speed Work: Race Modelling

Finally, a race modelling run will try and simulate the initial segments of a sprint race. Therefore, the emphasis is on perfect reproduction of acceleration mechanics (be that from a stand, blocks or 3 point start), smoothly blended into upright high speed running. The distances used will be longer for more qualified athletes but the total duration of the runs should always be less than 7 seconds. Because both acceleration and max velocity are almost maximal the rest required between runs will need to be higher than for acceleration or maximum velocity sessions alone.

Therefore, for a young athlete a typical session might be runs over 40m from a crouched start with 4-5 minutes rest between runs. For an elite competitor it might be runs over 60m with maybe up to 15-20 minutes between repetitions!

So there it is in theory but what does this look like in practice? Below are some sessions taken from our training with elite level athletes.

Acceleration Focus:
Khmel Acceleration Sessions:
- From Blocks: 4x10m, 4x20m, 3x30m
- From Blocks: 6x40m

Max Velocity Focus:
Khmel Max Velocity Sessions:
- 2x (2x [30m build up 30m fly])
  Harry Aikines-Aryeetey will typically run 2.75s for 30m through timing gates.

- [50m build up fly 10m], [40m build up fly 20m], 3x (3x [20m build up 20m fly])

Lester Max Velocity Session:

- Rep 1: [20m build up fly 30m]
  Rep 2: [Accelerate 20m fly 30m]
  Rep 3: [Accelerate 20m and float 30m]
  Rep 4: [Accelerate 20m fly 30m]

Race Model Focus:
Khmel Race Model Sessions:

- From 3 point: 4x50m – relay exchanges receiving the baton
- From blocks: 4x60m

Summary for SPEED WORK

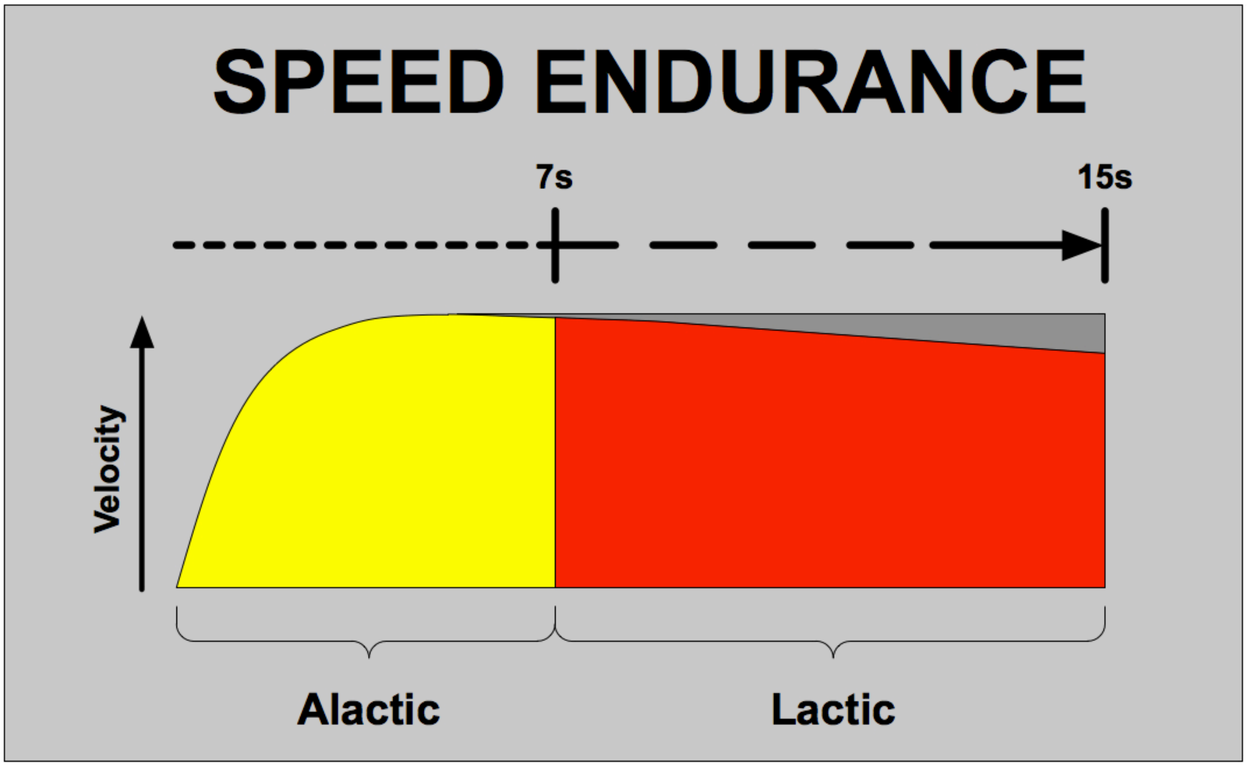
Intensity	95-100% (HIGH)
Rep Duration	Less than 7s
Recovery between runs	FULL (1-2min per second of activity)
Recovery time until next high intensity session	48 hours +

SPEED ENDURANCE

While it is important that an athlete improves their acceleration and maximum velocity, every sprint lasting more than 7s requires the capacity to endure the speed achieved by alactic means. Note that in the discussion we will use velocity and speed interchangeably although they are technically different.

High intensity runs (95-100% relative intensity) that last longer than around seven seconds rely on anaerobic metabolism to maintain muscular contraction and this leads to the build up of lactic acid within the muscles. Assuming acceleration is maximal, by the time seven seconds has past the vast majority of athletes will have finished accelerating and reached their top speed. From here on out the aim of the game is to maintain this speed for as long as possible. The term 'Speed Endurance' has been coined for work aimed at improving this quality and is typified by runs lasting between seven and fifteen seconds at 95-100% intensity, where full recovery is used between reps and sets.

In order for an athlete to train speed endurance they must first get very close to their maximum possible velocity and then maintain this for a period of time without a significant drop off in speed. The key difference between speed and speed endurance work is that during speed endurance sessions the athlete's anaerobic metabolism is challenged. Like speed work, full recovery should be taken between sets and reps and the time required for an athlete to achieve full recovery will typically be one to two minutes per second of sprinting. Once again, longer rest breaks will be required for athletes of a high performance standard than those just starting out.



Because athletes of different standards are capable of running different distances in 15s the distances used for speed endurance sessions will vary from athlete to athlete. For youngsters 100m may be the furthest distance used for speed endurance work while, for Usain Bolt 160m may fall within the 15s range!

With this in mind examples of speed endurance sessions for young athletes performed close 100% intensity might be:

- 4x50m with 5min rest between runs
- 60m [6min rest] 80m [8min rest] 100m
- 2x100m with 10min rest between runs

For an elite performer these sessions could be adjusted to be:

- 4x80m with 10min rest between runs
- 80m [10min rest] 100m [15min rest] 120m
- 2x150m with 15-20min rest between runs

The number of reps for this type of work is determined by the ability of the athlete to minimise drop off in terms of top speed. With reps lasting around 15s, where each rep is performed at close to 100%, an athlete may only ever be able to perform 2-3 reps before the intensity drops below 95% or perceived effort is such that they are unable to produce a relaxed sprinting action. **As with any complex co-ordination task once fatigue sets in, and perceived effort increases, the session should be brought to a close to ensure the athlete does not practice poor technique.**

If the session is continued once intensity drops below 95% or technique breaks down then the quality being trained is no longer speed endurance but another category of work, (usually intensive tempo) which we will discuss later.

While the volumes shown in the above sessions are fairly low, for sessions where runs are performed at 95% intensity the total session volume can be a lot higher because each rep is slower and less fatiguing. Remember while 95% sounds fast it is a lot less fatiguing than 100%.

Real life example sessions we have conducted with our elite athletes include:

Khmel Speed Endurance Sessions:

- 4x150m rest 12-15 minutes in 15-15.80s
- 6x120m rest 6 minutes (accelerate 40m, float 40m, 40 pick up) 12.70-13.30s

Lester Speed Endurance Session:

- 2x (120m in 12.50s rest 8 minutes, 80m rest 8 minutes, 60m in 6.50s rest 12-15 minutes)

Summary for SPEED ENDURANCE

Intensity	95-100% (HIGH)
Rep Duration	7-15s
Recovery between runs	FULL (1-2min per second of activity)
Recovery time until next high intensity session	48 hours +

SPECIFIC ENDURANCE

It is almost impossible to prevent a severe decline in top speed for runs lasting more than fifteen seconds, where maximal acceleration is utilised. Therefore, when an athlete knows they will have to run for longer than fifteen seconds, they will automatically employ slightly sub maximal acceleration and reach slightly lower top speeds in an attempt to achieve the best possible time for the longer distance. This is clearly demonstrated in analysis of races of 200m and over where athletes exhibit excellent maintenance of slightly lower top speeds than in the 100m dash.

Because longer sprint races require athletes to endure a sub maximal pace, the running mechanics used for these events are slightly different to those seen in the short sprints. This is clearly observable if you compare the same athlete running the 100m and then the 400m. For example, the arm action is generally less exaggerated when running the 400m because the athlete is trying to save energy and any additional range of motion that absolutely necessary becomes inefficient.

To ensure an athlete can optimise their technique for running at slightly sub maximal speeds they need to practice. Training that helps them to develop this capacity is termed 'Specific

Endurance' and is defined as runs lasting greater than 15s at 95-100% intensity where full recovery is taken between reps and sets.

While Specific Endurance looks very similar on paper to Speed Endurance the key feature is that the athlete never reaches top speed and so learns to endure a sub maximal pace using slightly different biomechanics. The longer the distance the more 'compact' the technique generally becomes and so athletes use different techniques when running different distances. This is why this type of endurance is termed 'specific' because it rehearses all of the factors associated with holding specific sub maximal velocities experienced during competition. Therefore, the distances used for Specific Endurance runs will depend on the distance over which the athlete intends to race. 200m runners will generally stick with distances up to around 250-300m (usually around 30s of work) while 400m runners could go anywhere up to 600m per rep (typically 30-90s).

Like Speed Endurance, Specific Endurance workouts are conducted using full recovery between reps and sets – e.g. enough recovery to permit the athlete to be able to perform each repetition without a drop off in performance. Again, this will mean longer recoveries are required for more qualified athletes who are reaching higher absolute intensities than for younger developmental athletes. As a rule of thumb full recovery between Specific Endurance runs will typically be between 0.5-1.5 minutes per second of activity. So a 30s rep may take anywhere from 15 to 45 minutes to recover from depending on how fast it was run.

Because the absolute intensity of Specific Endurance runs are lower than Speed Endurance the effect on the central nervous system (CNS) is generally less. Therefore, athletes can typically recover faster from Specific Endurance workouts than they can from Speed Endurance. However, because of the highly anaerobic nature of the work the perceived effort is significantly greater during and immediately after Specific Endurance workouts. **So the workouts feel harder at the time (because the reps last longer) but are easier to recover from long term (because the absolute intensity is lower).**

Some examples of Specific Endurance workouts taken from our practice include:

Lester's session:
1x350m, with perfect pace judgement for the 400m. For Nicola Sanders the aim is to go through 100m in 12.0s, 200m in 24.0s and 300m in 36.0 and then finish as fast as possible. Roger Black was capable of doing this session in 10.9s/21.4s/32.2s

Khmel's session:
3x200m. Each run getting slightly faster with the final rep close to 100% - usually around 20.8s for Harry Aikines-Aryeetey.

Summary for SPECIFIC ENDURANCE

Intensity	95-100% (HIGH)
Rep Duration	15s+
Recovery between runs	FULL (0.5-1.5min per second of activity)
Recovery time until next high intensity session	48 hours +

SPECIAL ENDURANCE

Both Speed Endurance and Specific Endurance runs are performed off of full recovery and aim to rehearse and refine the biomechanics used during competition. While these kinds of workouts certainly have an endurance component to them, the key focus is on developing quality sprinting at race pace velocities.

However, there are times when the coach wants to overload the body to create a unique or 'special' adaptation. For example, a coach in the short sprints may wish to improve work capacity for repeated maximal acceleration so an athlete's performance does not drop off as they progress through rounds. For a 200m athlete the coach may wish to get them used to running at a higher percentage of their maximal velocity for a further distance that is currently possible. In the quarter mile the plan may be to have the athlete practice perfect race rhythm and get used to completing the final part of the race at the pace faster than they are currently capable. Special Endurance sessions can be devised as a solution to all of these scenarios and workouts in this category are defined as runs of 95-100% intensity with incomplete recovery between reps and or sets.

The most common form of Special Endurance workout is the 'split run'. Split runs are where a longer distance is 'split' into smaller segments with a short rest break between segments. For example a split 600m could be 200m, 1min rest, 200m, 1min rest, 200m. The short breaks allow the athlete to run each 200m faster than they might do in a flat out 600m Specific Endurance run but still experience a significant challenge to the lactic energy system.

Under the split 600m scenario although the velocity reached is higher than it would be in a Specific Endurance run it is still sub-maximal. However, if split runs are performed with more extensive breaks, the athlete can reach their maximum velocity several times in quick succession and this can be a very effective way to overload endurance qualities for a short sprinter.

For example a split 150m could be 3x50m and a split 180m could be 3x60m or 2x90m. During split runs the recovery is incomplete and so the fatigue accumulates as the set progresses. Therefore, the first run will feel fairly easy but by the last perceived effort will have increased substantially.

Examples of this kind of Special Endurance workout, for elite level athletes include:

Lester's sessions:

- 3x(3x60m) with 2min between reps, 10min between sets. Each run of each rep gets faster. Marlon Devonish will typically run 7.2s, 6.8s, 6.5s.
- From blocks run 40m slow down to the 100m finish line. Rest 1min then run 60m back up the track (Marlon will typically run 6.5s for the 60m). Repeat 4 times with 12min rest between sets.

- 8x50m with 30s rest between reps (a split 400m); rest 3 min between sets then 4x100m with 45s rest (again split 400m); then 4 min set rest followed by 2x150m with 45s rest between reps (split 300m); 4 min set rest and finally 1x200m

Split runs can also be conducted using distances that do not permit the athlete to reach maximum velocity. Such work aims to improve the capacity of the athlete to perform repeat maximal accelerations. While this is not typically a feature of competitive events, it becomes useful when you consider the number of starts that might occur over the course of a day, featuring multiple rounds, false starts and practice starts.

For an athlete that reaches top speed at 40m these kinds of workouts might include:

- 4x(3x30m) block starts with 3min between reps and 5 between sets (split 90m)
- 2x(4x40m) with 2 min between reps and 10 min between sets (split 160m)
- 5x(2x20m) from 3 point start with 1min between reps and 3min between sets (split 40m)

The 400m lends itself to Special Endurance work due to the dramatic drop off in velocity that occurs during the race and the very precise relationship between success and achieving an appropriate race rhythm. While Specific Endurance work is also useful in this context, the ability to perform runs of different distances with short breaks in between efforts is a nice way to rehearse the finer details of the 400m sprint. Examples of Specific Endurance sessions we have employed with success over 400m with elite level athletes include:

Lester's sessions:

- From blocks run 200m at race pace (23.8s for Nicola Sanders), decelerate around the turn and walk top bend (which must take no more than 45s) then run 100m in 12s. Rest 15-20min and then repeat.
- From the 100m start using blocks run 60m then decelerate and walk to 150m then run 80m (50m on the bend and 30 on the straight). Repeat x 3 with 12 min rest between sets. Finish with 1x300m in 33/34s for guys and 36.5/37.5 for girls.

Summary for SPECIAL ENDURANCE

Intensity	95-100% (HIGH)
Rep Duration	Split runs lasting longer than 7s
Recovery between runs	INCOMPLETE
Recovery time until next high intensity session	48 hours +

Specific Developmental Exercises (SDE): Low and Medium Intensity Work

Up until now we have purely described high intensity training methods which, to recap, are Speed, Speed Endurance, Specific Endurance and Special Endurance. All these training methods share a common theme in that they are performed at 95-100% relative intensity and reinforce the running mechanics used during competition.

However, sprinters also use runs of below 95% intensity to target the development of specific energy systems, to prepare their body for high intensity training methods and also as a form of active recovery.

INTENSIVE TEMPO

Sitting just below Speed, Speed Endurance, Specific Endurance and Special Endurance on the intensity ladder, Intensive Tempo is used to describe runs at greater than 75% but less than 95% intensity. These runs emphasise rhythm and pace judgement. Work in this range is often referred to as 'middle intensity' or 'mid zone' work and is performed off of incomplete recovery.

Sprinters focused on longer events often use Intensive Tempo in their preparation and it was a prime component in 400m world record holder Michael Johnson's training regime. Although considered, by some speed based coaches, as not being fast enough to specifically develop the qualities required for the 100m, Intensive Tempo is fast enough to require the body to tap into the lactic energy system to maintain muscular contraction. Therefore it can be especially useful for developing the body's ability to operate efficiently under the lactic conditions that occur during longer races such as the 400m or 400m hurdles. However, because the intensity falls someway short of competitive conditions, intensive tempo does not reinforce race pace biomechanics and so it should be used in conjunction with, or as preparation for, high intensity (95-100%) modalities.

Examples of Intensive Tempo sessions taken from our training regimes with elite level athletes include:

Khmel Intensive Tempo Sessions:

- 2 x (4x220m) at 27-28s pace; 2 min rest between reps; 6 min rest between sets.
- 6 x 220m at 27-28s pace; 2.5min rest between reps.
- 5 x 300m at 40s pace; 6min between reps.

Lester Intensive Tempo Session:

- Clyde Hart's 'Speedmakers' – on grass accelerate hard to 60m then relax for 40m then slow down and jog 50m then repeat 4 times. Perform 3 sets with 3min rest between sets. E.g. 3x[4x(60/40)]

Note that the rest breaks are short so recovery is incomplete leading to a rapid build up of lactate. Intensive Tempo sessions are generally the most painful (highest perceived effort) sessions an athlete will come across in training! While Intensive Tempo is hard work the aim is usually to keep the rhythm going throughout the session so that all runs are of similar 'tempo'.

As discussed previously, sprints coaches often confuse intensity with effort. Intensive tempo is responsible for a significant amount of this confusion because it can look very fast (94% intensity for a 10s 100m sprinter is still 10.65 after all!) and also requires a great deal of effort. Therefore, coaches often perceive work in this category as 'high intensity', when in fact it is 'middle intensity' but 'high effort'.

The key aim of an Intensive Tempo session is to overload the lactic energy system by performing a fairly high volume of work at a moderate intensity. However, due to the decreased intensity, the running mechanics used for Intensive Tempo can differ significantly to those used in competition. Analysis of the ground contact times and vertical displacement of the centre of mass for athletes running at mid zone intensities strongly reinforces this point. A practical example is to compare the technique of Usain Bolt's first round run (10.20s) in Beijing with his astonishing final. 10.20s is slightly less than 95% of 9.69s and already the differences to the naked eye are significant.

Because of this, a coach employing Intensive Tempo work must carefully select where, when and how much of this work is conducted. Get the balance wrong and an athlete may become so accustomed to running at sub maximal intensities that they lose the fine coordination required to run at race pace and therefore become prone to injury when they are exposed to high intensity training or competition.

It should also be noted that while the biomechanics used during Intensive Tempo are significantly different to racing, the intensity required is still high enough to significantly tax the CNS. As a result, just like high intensity work, it can take two or more days to completely recover from sessions and this consideration should be factored into training prescription.

Summary for INTENSIVE TEMPO

Intensity	76-94% (MEDIUM)
Rep Duration	Typically 15-90s
Recovery between runs	INCOMPLETE
Recovery time until next high intensity session	Typically 48 hours

EXTENSIVE TEMPO

Extensive Tempo is just a slower version of Intensive Tempo. The major difference is that during Extensive Tempo runs you deliberately try and avoid excessive build up of lactate and hydrogen ions. While Intensive Tempo is painful, due to the build up of hydrogen ions, Extensive Tempo simply causes you to loose your breath because the intensities used can be achieved using oxygen as the main fuel source, making it aerobic in nature.

While Extensive Tempo seems of little value to sprinters, because the velocity is so far removed from what occurs in competition, surprisingly it is very popular among some sprint coaches because it gets the blood circulating and loosens up stiff muscles. Indeed, some sprinters have been known to perform up to 10,000m a week of Extensive Tempo as a method of active recovery from their high intensity work. While Extensive Tempo requires a high level of effort athletes will quickly recover and often feel ready to perform more work within minutes of finishing. This is because while the effort was high the relative intensity was low and so the effect on the CNS is insignificant and fine motor control is largely unaffected.

Example workouts can include runs of varying distances at around 60-75% separated by short periods of rest, light jogging or walking. A few examples could be:

- 10 x 100m walk back recovery
- 2 x (100 + 200 + 300 + 200 + 100) walking 50m between reps and 100m between sets
- 10 x (run 200m + walk 200m)
- 10 x 400m with 300m walk recovery – aimed more at 400m runners

As a general rule the speed of all the runs should be consistent and if the athlete is too winded to hold a conversation while running then they are going too fast or the session is beyond their current capacity.

There are lots of different ways of structuring Extensive Tempo workouts. An example of one of Tony Lester's favourite sessions is as follows:

> Using the infield of the track with a 300m internal circumference the aim is to run laps so that the first half is covered in at least 25s, three quarters of the lap in at least 45s and a complete lap should be finished in around 50s. The workout consists of 10 runs.
>
> Run No. 1 = 2 laps continuous; 4min rest
> Run No. 2-5 = 4 x 1 lap; 45s rest between reps and 4min before run 6
> Run No. 6-8 = 3 x ¾ of a lap; 45s rest between reps and 4min before run 9
> Run No. 9-10 = 2 x 1.5 laps; 1min rest between reps
>
> The athletes wear heart rate monitors and the heart rate data is recorded. As the athlete gets fitter the average heart rate during the session will decrease. To keep the session consistent the coach must ensure the athletes stick to the allotted pace and do not go faster as they get fitter.

Summary for EXTENSIVE TEMPO

Intensity	Less than 75% (LOW)
Rep Duration	Typically 15-90s
Recovery between runs	INCOMPLETE
Recovery time until next high intensity session	Typically 24 hours

Specific Developmental Exercises: Resisted and Assisted Sprints

Both Intensive and Extensive Tempo are methods of training that could be classified as Specific Developmental Exercises (SDE) on the UKA Exercise Classification Hierarchy because they repeat the competitive event (running) but overload the lactic and aerobic energy systems. However, there are two other forms of sprint training that can also fit into this category – resisted and assisted sprints.

RESISTED SPRINTS

Resistance can be added to sprints through a variety of different methods. Hill work is perhaps the easiest to implement; the steeper the hill the greater the resistance. Pulling a sled or using a bungee or other type of resistance device is another way of achieving a similar effect on the flat. The key difference between hills and other resisted variations is that the hill simply decreases the angle at which the athlete must lean forward to achieve their optimal acceleration position (typically in the region of 45 degrees when measured as the straight line from head to foot while the stance leg is fully extended at the hip, knee and ankle). This allows athletes who are perhaps not strong enough to handle 45 degrees under normal conditions to learn what it feels like to be in this position. Hills also slow the athlete down giving them time to think about their movements. This makes them a great way to teach good acceleration mechanics. Sled work and other resisted modalities, however, require the athlete to achieve good acceleration angles under load and so are perhaps more suitable for the mature athlete.

Regardless of which method of resistance is chosen, all resisted sprints are by definition slower than they would be over the flat. Therefore, a key question is 'what is the appropriate amount of resistance to use?' Typically, we find that if an athlete is slowed down by more than about 10-15% they begin to alter their mechanics to overcome the additional load. Therefore, if we time an athlete at 4s over a 30m start on the flat, we would not expect them to run any slower than 4.4-4.6s over the same distance during a resisted run if we wanted to work on developing good mechanics.

Levels of resistance and gradients of hills that slow them down more than this would be considered more a form of specific strength training for the muscles used during acceleration. From a practical perspective we have used a range of hills both on grass and on concrete with athletics mat rolled out so the athletes can run in spikes. When using spikes the gradient of the hill is usually limited to around 15 degrees to avoid major changes in running technique.

In a similar fashion, the distances chosen for resisted runs change the nature of the activity. Short distances (10-30m) can be used to work on acceleration mechanics at slower speeds while longer distances are more a form of strength endurance for acceleration, as athletes typically maintain a forward leaning position in order to overcome the resistance.

The final method of resisted running is sprints into a headwind. This method does not generate the levels of resistance experienced during sled or hill work but does allow you to overload upright running mechanics to some degree. Because running into the wind reduces absolute intensity it is typically used on days when you want to deliberately hold your athlete back, such as during a period of dense competition or when they have tight muscles.

Summary for RESISTED SPRINTS

Intensity	Less 100% depending on resistance level
Rep Duration	Varies depending out desired outcome
Recovery between runs	Varies depending on desired outcome
Recovery time until next high intensity session	Typically 24-48 hours

ASSISTED SPRINTS

The opposite of resisted running is Assisted or 'over-speed' work. Running with the wind at your back is the safest and easiest form of over-speed a coach can implement but you are at the mercy of the elements and so exact conditions are not reproducible. Unless you are running in a hurricane, the assistance provided by a tailwind does not push the athlete along but rather reduces air resistance because the air molecules are already moving at similar speeds to the athlete. This permits an athlete to execute their normal running mechanics for longer and in a more relaxed fashion, which has a beneficial effect on skill acquisition.

Running downhill is another way to help an athlete achieve speeds they would not normally reach on the flat. However, this method requires a very smooth surface with a very small gradient. If the angle of the hill is too great the athlete's body will drop a significant additional distance with each stride, placing excessive stress on the muscles that will have to absorb the shock. For example, an athlete with a 2m stride length running down a 5 degree hill will experience an additional drop height per stride in the region of 17cm! There are very few places in the world where you can safely train using a downhill runway. One such place is the Olympic Training Centre in Formia Italy, where there is a downhill section of track, which uses perhaps less than a one-degree gradient. There we have used perhaps only 4-6 runs over 60m with 30m of a build up and 30m flying. Even then we found that the speeds were difficult to control and the safest way of execute the runs was to keep the acceleration portion of the run very relaxed and allow the speed to build naturally. This was with senior athletes running in the 10.10-10.20s range and even then they found this kind of workout difficult to execute.

A more accessible option is to use one of the many pulley or bungee devices commercially available. However, while these systems pull the athlete through the air at high speed it is difficult to assess what is happening in terms of the way the athlete's limbs are loaded when they do make contact with the ground. Furthermore, it is all too easy to tighten up whilst being pulled and this can lead to over striding – a key factor in hamstring injury.

Both downhill and pulley systems bring with them a significant risk of injury that must be balanced against any potential benefit. Certainly, neither method is necessary for the developmental athlete and coaches should think long and hard about where and when they are appropriate even with advanced senior athletes.

Summary for ASSISTED SPRINTS

Intensity	Greater than 100%!
Rep Duration	Less than 7s
Recovery between runs	FULL (2-3min per second of activity)
Recovery time until next high intensity session	Greater than 48 hours

Assisted Sprints: Absolute Intensity and Recovery

The higher the absolute intensity of the activity the greater its effect on fine coordination and motor control and the greater the recovery requirements between reps, sets and workouts if the athlete wants to reproduce the performance.

Regardless of which method is used (wind, downhill or pulley) Assisted training is the highest absolute intensity activity in the coach's toolbox and brings with it an unknown recovery requirement depending on just how fast the athlete goes.

After Assisted sprinting, training methods can be ranked in order of absolute intensity with pure Speed work being next in line followed in order by Speed Endurance, Special Endurance, Specific Endurance and then Intensive Tempo, Resisted Sprints and finally Extensive Tempo.

As absolute intensity goes down, perceived effort goes up and so this is where the coach must differentiate between the immediate and delayed effects of the workout. The higher the absolute intensity the longer it takes for the effects to manifest themselves. So while an Extensive Tempo workout may feel very tiring the athlete recovers from it rapidly, while an over-speed session may feel effortless at the time but a few days later the muscles begin to tighten up and the true impact of the session on the nervous system can be more readily assessed.

It is important that a coach understands these differences so they can better predict what sessions will work well together. For example, in our practice it may be normal for us to perform a speed session on Monday and then come back on Wednesday and run a Special Endurance workout. However, if we were in Formia and decided to switch Monday's session for some downhill runs then we may instead decide to do weight training or an Extensive Tempo session on the Wednesday because we can predict that the athlete will be sore and tight and so the chance of injury during a Special Endurance workout may be too great.

PART 3: TRAINING IMPLEMENTATION

Intensity boundaries in practice

In order to distinguish between training methods throughout this article we have deliberately provided intensity boundaries in percent so as to separate high, medium and low intensity workloads from each other. However in reality the lines are blurred. While formally all Extensive Tempo runs should be 75% or less some athletes with a greater propensity for endurance may be able to run at 80% without the build up of lactate. For these individuals work at 80% with incomplete recovery may elicit all the training responses we would expect from an Extensive Tempo running session – i.e. the development of the aerobic energy system. However for more heavily muscled, power based, runners the same workload would be a tough Intensive Tempo session resulting in a significant build up of lacate.

At the other end of the spectrum the lines between Intensive Tempo and some types of high intensity work such as Special Endurance can also be debated. For example, Clyde Hart's 'Speedmaker' workout could be classified as Intensive Tempo because the short recovery will keep the pace of the final few runs below 95% relative intensity for 100m but it could also arguably be a Special Endurance session. 3x[4x(60m/40m)] with 45s rest between reps and 3min between sets is essentially 3 sets of split 400m and if all reps are conducted at the come home pace of the last 100m of a quarter mile then the entire session may still fall within the 95-100% range.

In such a situation it is up to the coach to decide what adaptation they are looking for and classify the session accordingly. If the key focus of that workout is on challenging the lactic energy system then the session should probably be classified as Intensive Tempo. On the other hand if the key focus is on maintaining perfect technique under fatigue so that by the end of the workout you are replicating the come home pace of the 400m then it is probably Special Endurance. Either way the athlete should be aware of the intended outcome and the coach should understand the impact conducting that workout has on the athlete and the overall training programme.

Revisiting the UKA Exercise Classifications

Now we have covered all the major variations in sprint training and discussed how they relate to each other in terms of absolute intensity we can consider how they all fit into the UKA Exercise Classification Hierarchy and subsequently how they support each other in a training programme. Speed, Speed Endurance, Specific Endurance and Special Endurance can all be classified as Competitive Exercises (CE) because they are almost identical to what happens in a race in terms of the mechanics that are used to execute them. Resisted sprints, Assisted sprints, Intensive and Extensive Tempo are all SDE because they replicate the movement pattern (running) used in competition but overload the physiological systems.

Specific Developmental Exercises are used to develop qualities in an athlete that support higher levels of performance at the Competitive Exercise level. For example, Resisted sprints help to develop the specific strength and technique required for acceleration, while Assisted sprints help to develop maximal velocity. Together they support the development of Speed Work. Similarly, Intensive Tempo develops the lactic energy system, which supports performance of all forms of high intensity endurance work (Speed, Special and Specific Endurance). Extensive Tempo also aids in longer Specific Endurance work by developing the aerobic energy system.

However, it should also be remembered that the movement pattern used during SDE is not as specific to the event being trained for as CE, so too much emphasis on SDE can negatively impact upon competitive performance. Therefore, when planning a period of training the key focus should be on finding a good blend of SDE and CE that optimises development of the different systems and also excellent running mechanics.

Practical Considerations

So far we have spent most of our time defining the most common training methods and now this has been completed it is time to summarise some practical considerations.

Intensity Considerations

At the very start we discussed the difference between absolute and relative intensity, as well as the distinction between the immediate and delayed effects of training. To recap the higher the absolute intensity the greater the delayed effects of the activity and generally the easier it feels at the time. Therefore, speed work and over-speed (assisted) training (where the athletes reach the highest velocities) may feel very easy at the time but the fatigue generated will not be immediately obvious until the next day or even several days later. As the absolute intensity drops and duration of the runs increase the energy systems stimulated will switch from alactic to lactic or aerobic in nature. This will increase the acute and immediate effects of the activity (because the heart has to pump harder and the body has to process lactate), making the athlete feel out of breath or even nauseous during or immediately after training. However, the delayed effects may not be as significant as one might expect, especially for aerobic style training such as Extensive Tempo which takes hours rather than days to recover from once the athlete is used to performing it.

In practice this means that the faster you run the more careful you have to be about scheduling your next training sessions. The faster the athlete's performance the greater the recovery time needed before they can safely undertake another high intensity session. This is because the high absolute intensity will suppress the athlete's ability to perform the fine co-ordination required to execute high intensity activity, making them susceptible to injury until they are fully recovered.

This also has a bearing on the types of sessions that are scheduled the day after high intensity sessions. If you want to allow the nervous system to recover you are going to have to schedule low intensity activity the next day and if you choose not to then you should understand that you are increasing the time it will take for the athlete to recover and make adjustments accordingly.

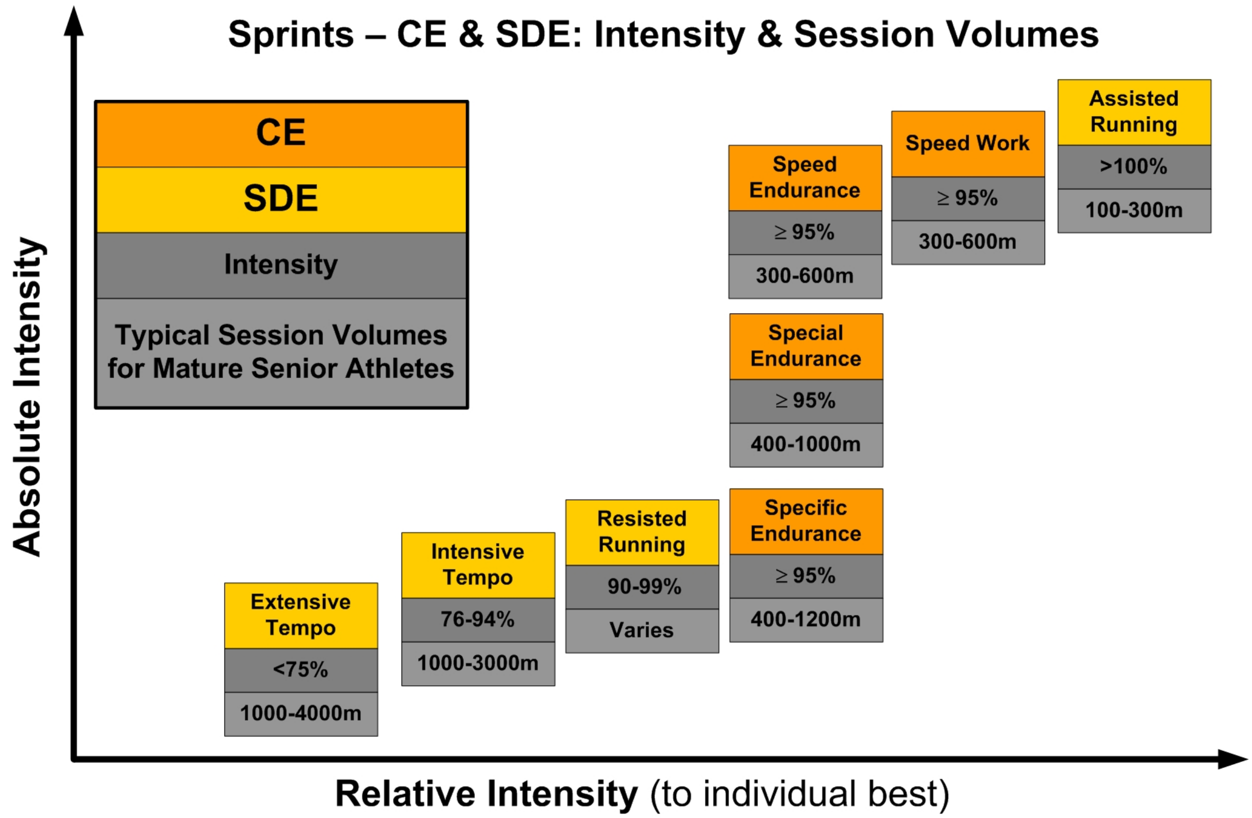
Volume Considerations

Having decided to design a session for a certain training category the question then becomes 'how much volume is appropriate?'

With all methods in the Competitive Exercise (CE) category (Speed, Speed Endurance, Specific Endurance and Special Endurance), volumes are ultimately guided by visual inspection of the technique. **When technique begins to break down sessions should be cut short. As the athlete becomes more and more conditioned to this kind of work they will be able to tolerate more volume without losing technique.**

For methods that fall under the Specific Developmental Exercise (SDE) category, perfect technique is also absolutely essential for Assisted running. The visual inspection rule should generally also be applied to Resisted work, especially if the aim is to target acceleration mechanics. However, for the other SDE methods of Intensive and Extensive Tempo some break down in technique may be tolerated, as the aim is to overload the lactic and aerobic energy systems – the key question for the coach is 'where do you draw the line?'

The higher the absolute intensity of the work, the lower the volume that can be tolerated in any one session. However, there is also a need to consider the total density of work performed. For an athlete who only trains once a week the volume for that single session may be higher than if the same individual was training three times in the same period. Through experience we can provide general guidelines on typical session volumes for well conditioned fully mature senior athletes.



Note that the reason there is such a variation in ranges is because of the variation in intensity for each method. For example, all the CE methods can be performed between 95-100% relative intensity. Since the fatigue generated by intensity rises exponentially a run at 100% is significantly more fatiguing than a run at 95% and so a session conducted at 100% intensity could have half the volume of one conducted at 95%.

In terms of coaching developmental athletes, volumes will generally rise progressively with training age until they approach senior levels. However, interestingly as athletes begin to approach their maximum genetic potential during the end of their careers volumes may actually decrease because each repetition is now so fatiguing that the only way absolute intensity (i.e. performance) can continue to improve is by doing less but at higher quality.

Footwear and Surface Choices

Running work can be done in flats/trainers or in spikes, on grass or the track. Although the choice is largely down to the individual there are a few things to keep in mind. Running on grass or in flats generally slows the maximal running speed (and hence reduces absolute intensity) because deformation of the shoes or the surface during ground contact increase the time spent on the floor. Therefore, running on grass or in flats will require more muscular work, as opposed to elastic work, because the foot does not bounce off the ground in the same way as it would when running in spikes on the track.

Conversely, running on the track will feel easier on the muscles because the elastic recoil of the foot off of the ground requires them to carry out less work. This is a big reason why running on harder tracks in spikes leads to faster running times. However, you pay a price for the increased intensity because at a structural level the body has to absorb more force and this increases the risk of injury. Furthermore, the stress on the central nervous system (CNS) is increased due to the higher absolute intensity meaning it will take longer for the athlete to regain fine motor control before the next workout.

When deciding what shoes to wear and what surface to run on it is generally suggested that spikes should be worn for work of high intensity runs (Speed, Speed Endurance, Specific Endurance, Special Endurance and Assisted sprints) and this kind of work should be carried out on the track in order to ensure the intensity levels can be easily reached. Intensive Tempo can be done on either track or grass and in flats or spikes. Generally the faster the target times the more likely the athlete is to choose track and spikes but any combination of surface and footwear can be chosen so long as the required intensity level can be reached. Extensive Tempo meanwhile is perhaps best performed on grass and in flats, though on wet days some may prefer to do it on the track in cross country spikes (or other padded shoes with good grip). Resistance work can be performed using any combination of footwear and surface depending on the primary goal of the session. Once again the high the intended absolute intensity of the resisted work the more likely you are to choose track and spikes.

In general the higher the volume of work in your training programme the more likely the coach is to take every opportunity to spare your legs by running on grass or in trainers or flats. This is especially important for athletes at later stages of development who are training several times a week and are, therefore, more likely to suffer injuries as a result of repetitive stress.

Summary & Conclusions

The running portion of a sprinters' programme can be classified with respect to the fuel source, intensity, duration and rest break between reps, see Table 1 below.

	Energy System	Intensity	Rep Duration	Recovery	Footwear & Surface
Speed Work	Alactic (ATP/PC)	95-100%	Up to 7s	Complete	Spikes on the Track
Speed Endurance	Lactic	95-100%	7-15s	Complete	Spikes on the Track
Specific Endurance	Lactic	95-100%	15-90s	Complete	Spikes on the Track
Special Endurance	Lactic	95-100%	Typically 5-40s	Incomplete	Spikes on the Track
Assisted	Alactic	Greater than 100%	Up to 7s	Complete	Spikes on the Track
Resisted	Depends on duration	Always less than without resistance	Any	Depends on energy system targeted	Spike/Flats on Grass or uphill Track
Intensive Tempo	Lactic	Less than 95% but greater than 75%	Any	Incomplete	Spikes/Flats on Grass or Track
Extensive Tempo	Aerobic	75% or less	Any	Incomplete	Flats on Grass

Table 1: Further information on sprint training methods

While these six categories cover the majority of training methods some coaches will use other variations as well as long runs and other middle/long distance methods at different times of year.

Although the intensities and durations shown in Table 1 are a general guide they are not written in stone. Depending on the athletes' qualification (how fast they are) and level of conditioning things can change. For example the intensity of Extensive Tempo could go up to around 80% and still retain its recovery and aerobic benefits for some athletes especially if they have a high anaerobic threshold and exceptional aerobic capacity. **Therefore, in an ideal world the best way to judge what category a training modality fits into is to observe the athlete's response to the workout. This is why it is always important for the coach to monitor sessions and look for markers such as perceived effort.**

The choice of footwear and running surface is flexible but a general rule of thumb is the higher the intensity the more likely the athlete is to need to run in spikes. It is also important to include some running on grass or in flats to spare the legs, especially in programmes that involve a high level of volume or Intensive Tempo running.

In closing, there are many different ways to classify the running portion of a sprinters training programme. However, it makes sense for coaches and athletes to have a general understanding and common language to describe their training methods so coaches can easily discuss their programs with one another. It is also important that all coaches are aware of the difference between intensity and effort and the implications of intensity on recovery and biomechanics.

	Notes	Energy System	Intensity	Rep Duration	Inter Rep/Set Recovery	Recovery time until next high intensity session	Footwear & Surface
Speed Work	Acceleration: from when the athlete begins running to the point they reach maximal velocity. Max Velocity: typically can only be held for 2-3s before it becomes speed endurance. Can be achieved from a maximal or sub maximal acceleration.	Alactic (ATP/PC)	95-100%	Up to 7s	Complete	48 Hours +	Spikes on the Track
Speed Endurance	The athlete reaches maximal velocity and then tries to hold that for as long as possible. Stop the rep when the drop off becomes too great (more than 5% - 0.5m/s or so) This will be less than 15s for all but Usain Bolt	Lactic	95-100%	7-15s	Complete	48 Hours +	Spikes on the Track
Specific Endurance	Athlete reaches a SUBMAXIMAL velocity and holds this as long as possible	Lactic	95-100%	15-90s	Complete	48 Hours +	Spikes on the Track
Special Endurance	Overloads energy systems and velocities by using short breaks to allow an athlete to cover a set distance in a time faster than	Lactic	95-100%	Typically 5-40s	Incomplete	48 Hours +	Spikes on the Track

	normally possible via Specific Endurance These workouts are split run based. E.g. 300 1min 100 rather than 400m						
Assisted	The athlete reaches a speed faster than normally possible	Alactic	Greater than 100%	Up to 7s	Complete	48-72 Hours +	Spikes on the Track
Resisted	The athlete has resistance applied to the running action usually via a hill or pulling some kind of sled.	Depends on duration	Always less than without resistance	Any	Depends on energy system targeted	24-48 Hours	Spike/Flats on Grass or uphill Track
Intensive Tempo	Overloads the lactic energy system by using medium intensity but short recovery	Lactic	Less than 95% but greater than 75%	Any	Incomplete	48 Hours	Spikes/Flats on Grass or Track
Extensive Tempo	Overloads the aerobic system by using low intensity and short recoveries	Aerobic	75% or less	Any	Incomplete	24 Hours	Flats on Grass

RESOURCES:

uCoach: www.uka.org.uk/coaching

UKA Exercise Classification Hierarchy: http://coaching.uka.org.uk/document/uka-exercise-classification-hierarchy-v1.0-document/

Athletics Weekly: www.athletics-weekly.com