



Training Kids For Speed

by Steve Bennett

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Introduction

This e-book aims to integrate modern sprint training ideas into the methods used for the development of speed in kids of any age. The aim is for this book to help coaches and parents create a program which is more effective at developing speed both in the short term and the long term.

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The New Biomechanics of Sprinting



Athletes like Marion Jones and Maurice Greene display the latest technical model of sprinting. It should be every athletes goal to gradually develop the most effective technique. So what are the latest ideas?

To increase any athletes maximum speed means improving at least one of the following two things:

1. the number of steps the athlete makes per second (their cadence).
2. the effectiveness of each ground contact.

Improving cadence is very much related to decreasing recovery time (the time it takes to get the foot off the ground and back on the ground). Having a foot that hangs way out of the back of the body after ground contact is a common problem that increases recovery time. It is often caused by the athlete dropping their hips which causes a noticeably increased lower back curve (a butt out position). This creates a situation where the athletes compensate for their lack of knee lift by pushing more out the back. There are a number of problems associated with this excessive rear-side running action:

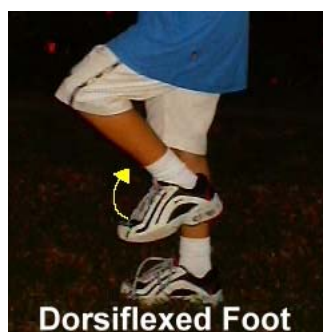
- Increased recovery time which results in a slower step-rate.
- Increased load on hamstrings which have to assist in the recovery action. Greatly increasing risk of hamstring injury.

- Decreased knee lift because knee lift is inhibited when hips are low and there also isn't enough time for them to be lifted higher with the late recovery. This consequently results in less powerful foot contacts.

Many of the worlds top athletes are now trying to decrease rear-side mechanics. The plan has been to prevent the thigh from swinging back any further than just 20 degrees behind the plane of the trunk. (note the Marion Jones photo she is in maximum hip extension). To do this requires that the athlete maintains high hips. Therefore minimizing the increase in lower back curvature. To do this the athlete needs a high level of strength and control of the muscles that maintain good pelvic stability particularly the lower abdominals. To develop this strength takes a few years of training in the right way.

It is important that the leg folds up close to the butt on recovery *but* in an athlete that is recovering early enough the foot should be closest to the butt when the thigh has already swung forward. Athletes that are recovering late have thighs that are vertical when the foot is at its closest to the butt. Performing butt kickers drills with a vertical thigh is very counterproductive in developing good recovery mechanics. It is best to make sure that the drills are always done so that the knee is forward when the foot is at its closest point to the butt and also fully dorsiflexed almost all the time.

Good leg recovery involves a cyclic action where the athlete strives to keep their big toe as close as possible to their shin (dorsiflexion), high hips, early recovery and recovers their foot over the height of their opposite knee. The action looks and feels like "stepping over long grass". This cyclic recovery action allows the athlete to develop a much more powerful acceleration of their lower leg moments later. Many athletes run by recovering their foot by pulling it through low and straight up. This is much more energy costly and slower.



When an athlete is in the position of their highest knee lift and they are maintaining high hips as well as a dorsiflexed foot. They are in a situation where they can generate using the gluteus maximus muscles a large amount of vertical force resulting in an explosive acceleration of the knee downward. If they have a dorsiflexed foot their lower leg can swing freely (without contraction of the hamstrings). The result is a rapid flinging backward of the foot, this is often called negative foot speed. It has been reported that elite sprinters can swing their feet backwards at speeds in excess of 50kph (30mph). Maintaining dorsiflexion until the foot hits the ground increases the quickness of ground contact and also helps contact to occur further underneath the body minimizing breaking forces. Some athletes have incorrectly developed a technique that produces high negative foot speed but they do not maintain appropriate dorsiflexion of their foot until ground contact. These athletes are at great risk of hamstring injury because they strike too far forward in front of their bodies which severely loads their hamstrings.

Active Foot Strike

Athletes should be aiming to impact the ground with a foot that is moving backwards. This is not unlike the impact when a kid is riding a scooter or a skateboard. The ground is moving backwards at a fast rate and when the foot first makes contact with the ground there is usually a jolt of deceleration before there is any propulsive force applied. This braking force can be decreased by creating a technique that has the foot moving backwards before it impacts and also making contact far enough back under the body.

Dorsiflexion

For the athlete to make an active footstrike and have a quick contact with the ground. It is essential that the athlete maintains dorsiflexion of the ankle (keep toes as close to shin as

possible). This pre-stretches the calf muscles and prepares them for a much quicker more elastic impact. Maintaining dorsiflexion also causes foot strike to occur later under the body.



A common (sometimes taught) error is for the athlete to point their toes away from their shin in an attempt to run on their toes as shown in the image to the left. This method has a variety of negative consequences:

- Usually unless the athlete is very strong they will simply increase contact time because their foot will be forced into maximum dorsiflexion after contact anyway. As a consequence controlling this rapid forcing back of the foot on impact puts a tremendous extra load on the anterior tibialis that often leads to lower leg injuries like shin splints, tibia stress fractures and even achilles tendonitis.

- The athlete running up on their toes (attempting not to let their heel hit the ground) is in much more of a pushing position. This means they will need to lean further forward to get maximum power out of an action that is more dependent on muscles in the front of the thigh. By leaning forward the athlete will also minimize the effects of the overstriding that they have because running with a pointed foot will cause foot contact to occur further forward.

- The forward lean usually is accompanied by an increased lumbar curve in the lower back. This often causes a situation where the athletes pelvic position will make it less possible to have muscular activity from the important Gluteus Maximus muscles due to inhibited activation. The Gluteus Maximus in Elite athletes works very powerfully in concert with the hamstrings to create the backward sweeping action of the thigh and result in a fast backward "flinging" action of the foot. If the Gluteus Maximus is inhibited and/or weak, the hamstrings then are forced to take over the load. Often this means athletes that run in this way have lots of problems with their hamstrings accordingly.

Arm swing should involve having the elbows swing in front of the plane of the trunk. Not swinging them far enough forward limits knee lift and results in greater rear-side mechanics to compensate. The angle of the arms should be mostly about 90 degrees at the elbow. The only time this angle should increase is when the hands are behind the body and then they may open up to no more than 120 degrees. The opening up of the angle makes it easier for the athlete to have a more relaxed arm action and also allows the legs to complete the cycle of movement.

Forward lean

Athletes should aim to run at maximum speed with a very slight forward lean that is evident throughout the whole body. They need to keep their hips up and have the right balance of front-side and rear-side running action. Leaning too far forward will result in the athlete increasing the rear-side action and introducing all the associated problems.

Head position

Athletes need to keep their chins down. Having a head that tilts backward often is accompanied by an increased lumbar curve and lower hips. This will decrease knee lift and negative foot speed.

Running Tall

Athletes need to aim to run tall. This means they keep their body long, their hips up and can have a high knee lift. Many athletes run low and have legs that are quite bent as they pass under the body. This causes them to have effectively shorter legs and a shorter stride length. The key to improving tallness of the runner is to develop more strength and to always practise running tall.

Relaxation

All athletes should aim to develop relaxation. This means focusing on using muscle that are required for running and stabilization. It importantly means learning to switch off all unrequired muscles as much as possible. There are many situations where athletes can practise

relaxation and seek to develop a good feeling when running that many athletes call rhythm. Young athletes particularly need to develop this skill because it is common for people to equate running at maximum speed with maximum tension. This is why this area needs careful and regular attention. Tempo sessions aim to develop endurance and desirable movement habits while relaxed. Relaxation is much more easily attained during Tempo sessions because all running is done at lower intensities.

Starting Technique

It is most important to distinguish between the technique when starting/accelerating and for running at maximum speed. Acceleration involves a significant pushing action where the quadriceps and calves are much more active. There is also as high a degree of forward lean as possible. The stronger and more powerful the athlete the more able they are to be leaning forward and apply a pushing force to the track. Many athletes and most kids are unable to apply enough force to start with the ideal technique because they are unable to push to straight their front leg when leaving the blocks or get anywhere near this in the steps that follow. However they should be encouraged as much as possible to strive for a strong forward leaning pushing action in the first 5-8 steps. It is important that the forward lean is evident throughout the length of the body not just a piked position from the hips or simply a head that is hung low. Its degree and effectiveness will improve as the athlete develops more strength and power.

The common mistake made by many athletes is to try to just stand up and run as soon as possible with the maximum speed technique. Standing up tall early puts the body in a position where it is unable to generate the same amount of force to the track in a pushing action and also prolongs the period of time that the sprinter will need to spend maintaining the technique for maximum speed. This often causes athletes who stand up too early to lose more speed at the end of races while fatigued than their peers who maintained a better acceleration body position for longer.

I believe with young kids it is better to do lots of fun reaction drills, acceleration drills etc. rather than lots of formal starts. Often they will be practising out of blocks a technique that is compensating for their lack of strength/power anyway and to a degree could be considered as therefore practising bad habits.

Sprinting & the Nervous system



Considering the function of the Nervous system in Sprinting is very important. It has a limited capacity to recover from certain types of activity. This needs to be understood when planning training and especially when leading into competitions. Dan Pfaff coach of some of the Worlds leading Sprinters (Bruny Surin, Obadele Thompson and Donovan Bailey) has made the statement like "it is as if the human nervous is powered by a 9v battery and is therefore easily flattened". Sometimes in the days after certain types of training an athlete is unable to run with as fast a cadence as usual, often also accompanied by lower maximum power output. It is in this situation that an athlete is said to be "flat".

Young athletes have nervous systems that are very limited in their capacity. Because of this young athletes will be unable to sustain maximum cadences or maximum power for very far at all. The upper limit is maybe only as far as 5s. The time a young athlete can actually spend at absolute maximum speed will probably be below about 3s. In training they may be able to do about 3-6 experiences of maximum speed in a session at the most before they are flat. The time to recover after nervous system flattening sessions will likely be at least 72hrs. This makes it only possible to train for maximum speed once a week if the athlete is racing that week or twice a week if they are not racing.

Training to minimize the effects of neural fatigue by improving its capacity could involve a range activities:

- Focusing on acceleration over 20m with total volume of sprints up to 200m
- Focusing on maximum speed development over 40-50m with total volume up to about 300m. It is very important that proper mechanics be used and reinforced. They don't all have to be at maximum effort.
- Multiple jumping and throwing.
- Short hill runs of 30m.

The most important thing to recognize is that athletes cannot develop more maximum speed by attempting training at maximum speeds when neurally fatigued. They simply would be practising bad habits and an inferior motor pattern. They would also be prolonging the period of flatness.

Racing requires Nervous system freshness for optimum performance. This means that the athlete should not perform training sessions that will produce lasting flatness that will persist to the competition date. Often athletes surprise themselves by performing better than expected after a period of minimal training stress, this in most cases especially in sprint events is because of the nervous system being "fully charged".

The way to find out an athletes tolerance to training and times required for recovery is to monitor it carefully. The young athletes in my squad are clearly slower over a standing start 40m run by a noticeable amount on "flat" days. If a session of maximum speed sprints over 40m is planned and the athlete is indicating they are flat in their first run, then I often change the session into a more relaxed tempo session. We certainly also avoid doing any maximum speed work in the 4 days prior to important races.

Many young athletes are encourage by the very structure of their competitions to overcompete almost every week during their competition season. Racing in more than one event is always a compromise because of nervous system fatigue.eg. If a young athletes competes on a given day in a 100m, 200m, 400m and LJ they will almost certainly have significant nervous system fatigue for at least 4 days. The only way that this can be minimized is by either choosing minimal events or "taking it easy" in some of them. If the aim is to develop excellence "taking it easy" should never be an option as this approach will likely result in the athlete losing their ability to focus with enough determination in high quality one off events so that they can be performed with ultra-high quality. It is best to train with great variety but compete with a high quality focus in minimal events during any competition meet. Vary the choices but always aim for quality performances every time the athlete enters any event. Awards for young athletes that reward maximum points earned in a given meet or season (that can be earned through overcompetition) are counterproductive to the goal of maturing quality athletes as seniors.

Strength Development



Young athletes need to develop strength in a functional way. This means training with a variety of movements that are performed well. It is best to avoid training that isolates muscles like body builders do.

It is very important to develop strength in the muscles that provide stabilization especially postural strength.

Kids enjoy variety and training with an atmosphere of fun is very important for them. So a good strategy is to have them perform an ever changing mix of activities.

Activities for Developing Strength in Kids.

- Medicine Ball Training - use an appropriate sized ball 2kg rubber bouncy medicine ball. Do a variety of exercises , learn to perform them really well, maybe just one set of 10 exercises with 10 repetitions of each.
- Bushwalks - good personal growth experiences over suitable terrain and durations. Good occasional off-season activity.
- Hill Training - mostly short hills 20-30m run with good form.
- Gymnastics exercises - climbing bars etc.
- Indoor Rock climbing - develops strength and confidence.
- Circuit Training - use a mix of bodyweight exercises.
- Free weight training - (avoid machine weights)

Free Weight Training

There has been plenty of research about weight training with kids. Recent research has shown that there is no increased risk of injury associated with Kids than with Adults when in a similar situation of starting with small amounts of specific and stabilization strength. However any weight training with children should be carefully supervised and they should start light focusing on developing good technique.

What about the Dangers? Any apprehension people have about doing this needs to be balanced with the scientific fact that landing on one leg during any kind of jumping can produce peak forces of 3-6 times bodyweight. It is the peak force being experienced or the repetitive impacts that are known to be the major injury risk factors. During weight training young athletes are limited in what they can do with free weights by their ability to stabilize and therefore balance the weight. This means that the loads are often very low initially in terms of total force. This is also why machine weights should be avoided in kids, they do not develop stabilization strength and they allow the athletes to generate very high forces that are in a real situation beyond their ability to control.

My strategy with young athletes has been to use a great variety of exercises some of which are weighted to challenge stabilization and therefore develop increased strength in this area. From this type of training the athletes gradually improve their postural position and stability. This is something that has great transfer into improvements in the running action. Strength training in young kids should be clearly focused on stabilization strength and core strength for sometime before it can sensibly progress to be really targeting the main muscles for propulsion (the prime movers).

Training in a way that improves running form and stabilization strength is an effective way to prevent injuries in any athlete. Many athletes that are advised to wait until their late teenage years to start strength weight training are missing out on an area of development that will likely help them avoid injuries.

I have found that athletes really enjoy the experience of gradually developing their strength in a variety of ways. The enjoyment being mostly a product of the perfected variety of things they have done and are doing.

Ankle Conditioning

If a runner has weak ankle dorsiflexors (muscles in the front of the shin) they will make a lot of noise when they run where those with well conditioned and functional dorsiflexors will make much less noise. It has been suggested that Kenyan athletes build up tremendous dorsiflexor strength and functionality because they spend their initial years of life running and walking endless miles while barefooted, instead of being in shoes. Consequently, many Kenyans are able to conserve energy during the stance phase i.e.. while their foot is in contact with the ground. This is because in addition to controlling plantar flexion, the dorsiflexors must also deal with the side-to-side motions of the foot and ankle during running, as well as the rotational motions which are a natural part of the running cycle. Any tendency of the foot to pronate must be controlled by the shin muscles. Any tendency of the foot to supinate must also be minimized by the dorsiflexors. It is important to condition the dorsiflexors to be able to cope with stress in the full range of directions. As well as improving efficiency, strengthening the dorsiflexors minimizes the risk of developing shins splints or stress fractures of tibia.

Exercise ideas for dorsiflexors (Anderson & Reynolds)

Shin Raises - athletes simply use their shins to lift toes up as high as possible when standing on their heels, perform 3 sets of 15. Progress can be made by varying both the range of motion and the speed. Athletes could also progress to doing them on one leg at a time.
Heel Step-Downs - Athletes step forward with one foot but by using eccentric contraction of the dorsiflexors they prevent the ball of their foot from descending any more than a few centimetres toward the floor. Maybe progress to 3 sets of 15 each leg. Athletes could increase the intensity of the exercise by taking longer steps and then to going down a high step.

Some ideas for shin conditioning during warm-ups are:

Walking on toes - Athletes walk high on their toes with their toes pointed straight ahead for 20 metres. Then 20m high up on their toes, but with the toes pointed outward with the rotation coming from their hips so that their whole leg rotates. Follow this with a high on toes 20m walk with toes pointed inward, once again by rotating from the hips.

Walking on heels - Athletes walk on their heels with their toes pointed straight ahead for about 20 metres and repeat like in the toe walks with their toes out for 20m and toes in for 20m.

Jogging on toes or heels - Progress can be made with both exercises by jogging gently while performing the above two variations. Further progress is made by skipping and this is of a much higher intensity.

Rhythm ankle bounding is performed by jogging along with very springy, short steps, landing on the mid-foot area with each contact and springing upward. In rhythm bounding the athletes ankles should act like coiled springs, compressing slightly as they land mid-foot and then recoiling quickly. This causes the athlete to bound upward and forward. Athletes progress toward performing a mixture of mini hops and rhythm bounding over 20m with around 100m of variations in total.

Dorsiflexion bounces are performed by jumping vertically and repetitively at close to maximal height, landing in the mid-foot area with both feet and then springing upward quickly after each contact with the ground. Athletes should dorsiflex their ankles on each ascent and slightly plantar flex their ankles just before making contact with the ground. Maybe start with ten dorsiflexion bounces progress to thirty and then toward doing them on one leg at a time.

Rhythm bouncing is jumping around moderately fast, with medium height, and with maximal motion at the ankles, but minimal flexion and extension at the knees and hips. Combine these with some low fast bounces of less than a few cm. All Rhythm bouncing should be performed as if the landing surface is very hot. The athlete could start with ten bounces and progress to forty.

Advanced Rhythm bouncing involves jumping in various directions and then eventually developing the ability to do them on one leg. The challenge of doing them in different directions increases the ability of the shin muscles to handle the side-to-side and rotational stresses during running.

Foot conditioning

The muscles of the foot when well conditioned can contribute to running efficiency as well as prevent injury. Research by Unger & Wooden on the effects of an arch strengthening on athletes produced gains of 4cm in the vertical jump and 11cm on a horizontal jump.

There are many simple ways to develop and maintain good arch conditioning e.g. spending time barefoot walking, doing smart amounts of running barefoot etc. An exercise called 'Toe grasping' can be performed by having the athlete stand barefoot with feet hip-width apart. They should then curl the toes of their right foot and then their left foot down and under, as though they are grasping something with the toes of each foot. It is recommended to do 2 sets of 50 repetitions with each foot. The aim should be for the athlete to try to pull themselves across the floor. Initially I have had athletes perform this exercise by having the athletes flex their toes in a pulling action to "scrunch" a towel under their feet.

Power Development



Preya Carey performing 4 bounds & a jump from a standing start here in 14.68m

It is important for kids to develop their ability to be bouncy - their elastic ability. The majority of kids used to play jumping games i.e.. skipping, hopscotch, fly etc. In the schoolyard often these games were played in hard leather shoes on concrete with hardly any consideration of shin injuries because they were most likely very rare.

Kids naturally learn to skip quite young and love to just do it instead of walking or running. I have watched my son as a toddler happily skipping spontaneously on many occasions. It is this attitude of "plyo play" that we need to expand on.

All bouncing activities develop the kids muscular abilities to elastically store energy as well as improve their nervous systems co-ordination of similar activities. A kid that never plays these games or "bounces" in play will most likely never develop the elastic qualities as an adult to as high a level as his peers who did plenty of bouncing as children.

Typically running athletes with superior elastic abilities are the fastest. Even in endurance running events the winners are often the athletes with the best finishing kicks. Recent research has also shown that plyometric training increases endurance running efficiency meaning that athletes can run at a given speed with a lower energy cost.

The Principles of Plyometrics

From a physiological basis, if a muscle is pre-stretched or made to build up high tension, it will concentrically contract with a much greater force. Like when you flick an object with your finger after pulling the finger back and then releasing the tension. Plyometrics make use of this factor. The key in performing plyometrics is that the response from the ground must be immediate otherwise the exercise turns into a concentric contraction and does not involve the stretch reflex.

The physiological theory behind plyometric training is to develop efficiency in the stretch/shortening cycle of muscle action. During the stretch (eccentric lengthening phase) of muscle action, a greater amount of elastic energy is stored in the muscle. This elastic energy is then reused in the shortening (concentric) muscle action that follows, to make it stronger. The key is to shorten the switching time i.e. the time it takes for the muscle to change from the eccentric lengthening phase to the shortening work phase. The fundamental principle of plyometric training is that it is the rate, not the magnitude, of the stretch that determines the utilization of elastic energy and the transfer of chemical energy into mechanical work. This means that this type of training does not need to be done in high volumes but instead it needs to be performed at manageable intensities of impacts.

Introducing Plyometric Training

Balance & Stabilization Tests and development of Basic Strength especially eccentric strength should come before serious plyometric training. Without adequate levels of eccentric strength, rapid switching from eccentric to concentric work becomes very inefficient. It is possible to evaluate eccentric strength through stabilization jump tests and observation of basic jumping exercises. A muscle contracts eccentrically when it acts as it lengthens to slow down the rate of muscle lengthening. e.g. when someone jumps vertically and lands their quadriceps muscles contract eccentrically to prevent the athlete from falling to the ground. The quadriceps resist the downward motion by acting to try to keep the legs more straight. Concentric strength is the ability to contract a muscle to shorten it and apply a force by moving a bone.

What to watch for during Plyometric exercises:

- If slow switching from eccentric to concentric work is observed, then eccentric strength levels are inadequate. Quick contacts displaying a rapid change of direction are essential.
- The foot strike must be on the full foot in order for the foot to help absorb the shock. It is incorrect to land completely on the heel or on the ball of the foot.
- The shock of the landing should be absorbed by a combination of the ankle, knee and hip joints working together that will absorb the initial shock of landing and transfer that force throughout the body's muscles.

Athletes should progress carefully with Plyometric Training. The method below was recommended by Vern Gambetta.

A/ Landing exercises

Standing long jump with two foot landing emphasis on "sticking" the landing. Athletes aim to land quietly on the full foot and absorb shock by bending at ankle, knee and hip. They could make progress to landing hops in a similar way. These training exercises improve eccentric strength.

B/ Stabilization jumps

Similar to landing exercises but hold for 5 seconds before initiating another hop or jump. When athletes can stick and hold 3 jumps progress to be able to stick and hold 3 hops on each leg.

C/ Jumping Up.

Jumping up onto a box (not down).- Jumping up is a lower intensity activity as the athlete does not need to absorb the impact of hitting the ground on landing as fast they leave it when they jump.

D/ Bouncing Movements in the one place

Ankle-bounces progressing to tuck jumps with quick contacts. It is important to perform them with an erect torso, good balance and by landing in the one place.

E/ Short Jumps

Start with 3 consecutive standing long jumps with two foot take off and landing.

Athletes could progress to 5 jumps, then to going up stairs jumping every second stair.

Eventually they should aim to perform single-leg hops and build up to 10 hops. Aim for a cyclic action of hopping (using an active foot-strike).

Moving past this stage of development should not be rushed. To avoid injuries and for the exercises to be most effective it is important to learn to perform all movements technically very well.

F/ Long Jumps

Aiming to add more horizontal velocity. Develop the technique of alternate leg bounding and of single leg hops. Carry out 10-20 contacts.

This is as far as most athletes may need to progress. A program should be designed that has a variety of jumps from all stages. They should be performed within a range of volume and intensity that is suitable for the athlete.

G/ Shock (Depth) Jumps

To raise power to the highest levels shock jumps can be used. This consists of jumps off boxes or rebound jumps over hurdles placed at mid-thigh height or higher. The training stress is high and this method should not be used with beginners of any age. Jumps over hurdles is a common method of plyo training BUT it is important to recognize that this an advanced form of plyometrics. The intensity of the shock is proportional to the height of the drop.

Note: Very recent research has indicated that gains in eccentric strength may contribute much more to improvement in jumping or running power than has been recognized. This emphasizes the potential value of the "landing and sticking" variety of plyometrics rather than just the "bounce" type.

Some ideas

The athletes in my squad have been training using a variety of Plyometric activities. They perform regular alternate leg bounding 3-5 sets of 5-10 contacts from a standing start throughout the off-season phases of the year. When alternate leg bounding the athlete needs to strive to stay upright, have a high knee action, flat footed active contact and a vigorous arm action. With most of the sets of bounds we do the athletes strive for maximum distance and the distance is measured noting improvement throughout the year. These are performed in racing flats on a Mondo surface and we have not had any problems with injuries from it. Other activities have included speed bounds with quicker contacts from a running start and bounding up short hills.

We also perform regular testing of standing triple jump, standing long jump, 4 hops as well as other combinations. All the athletes tend to improve their performances throughout the year. They love doing it as well and are very keen to learn to do it technically well because it will improve their distances. We stop doing plyometrics during the peak competition period because it is very challenging to the nervous system and can very easily produce periods of flatness that will negatively effect performance in competition.

Endurance Development



General Endurance

Young athletes should do a variety of things throughout the year to gradually develop their overall stamina. Rather than doing large volumes of one particular activity it is better to aim for as much variety as possible to build endurance.

It is also a good idea to avoid putting the athlete in situations where their technique fails. I have found that varying the activities adds to the fun and maybe a good way to develop endurance is for the athlete to simply arrive at being fit without really thinking they have had to strive for it. They just focus on enjoying the process while doing it well.

Important psychological development can come from long activities and the sense of enjoyment a young athlete can get may come from some suffering in striving for a goal. This type of situation should however not be typical of the approach toward developing endurance. e.g. Climbing a mountain bushwalk to be rewarded with the view from the summit is a great experience for anyone and there are some important lessons learned from it. However some play activities in short bursts like using boxing training type speed ball will be great fun that will also result in improved conditioning.

Some ideas for developing General Endurance

- Long Bushwalks - occasional events - great overall conditioning plus good mental training.
- Circuit Training - maximum variety of exercises - possibly competitive.
- Speed Ball - performed for fun
- Med ball exercises - maximum variety of exercises
- Cross country running - running easily to see the scenery quicker than walking, maybe simply run and walk.
- Playing team sports - great development as long as movement quality is valued and athletes are not expected to play slightly injured.

- Play activities - swimming, cycling, skateboarding, rollerblading, ice skating, roller skating, skipping, paddling, rowing, dancing etc.

Speed Endurance

Sprinting over any distance further than that required to accelerate to maximum speed involves speed endurance. An athlete can maintain absolute maximum speed for no more than about 3 seconds. In young kids it is probably no more than 2s. It probably takes a 15.0s 100m athlete about 4-5s to reach maximum speed somewhere near the 30m mark they can hold the speed for about 10m before there is a gradual decline in running speed. This means that the last 60m involves a gradual deceleration from the absolute maximum speed that is reached. If the athlete loses form dramatically near the end there can even be a rapid drop in speed in the last 20m.

The endurance that needs to be developed to improve performance in the 100m for young kids is the endurance of (near) maximum speed. There is however a big problem in this area of training for all sprinters. Most training that aims to improve endurance of near maximum speed risks "habituating" a slower maximum speed. e.g. When an athlete does 4 x fly60m sprints at maximum effort with 2min rests they are doing a speed endurance session. The theory is that the nervous system in this session gets 4 experiences of what it processes is the athlete's absolute maximum speed. This potentially can cause a drop in the athlete's effective maximum speed when they are fresh. Because of this conflict in training many coaches of elite athletes choose to focus firstly on developing maximum speed to a new higher level and then they train to put the required amount of speed endurance training at a corresponding higher speed on top of it as the major race season approaches. For some athletes the primary way that speed endurance is developed is in races only. This explains the growing breed of specialist 200m athletes as athletes that are focusing more effort on developing speed endurance at the slightly lower speeds evident in the 200m event. But because of the lower amount of maximum speed focus these athletes can have a lower standard of performance in the 100m than what is possible for them. They have however made their choice and in some cases it is a very good one.

Children should do only a small amount of training for endurance of maximum speed. It is best to gain the required speed endurance simply from races over 100m and 200m. It is important in doing it this way that athletes aim to maximize the quality of their performance. This means not racing too often or when tired. Many kids are very similar over 30m indicating that there are maybe only small differences in maximum speed between kids. So differences in qualities that contribute to endurance of near maximum speed are important when racing over 100m. However, when athletes focus directly on improving speed endurance by the use of speed endurance sessions they will likely be improving short term speed endurance at the expense of developing more maximum speed during that training period. Plus they will also be most likely "training in" bad habits that will limit the athlete's long term development and increase the risk of injury. It is best to cycle between periods of maximum speed development and speed endurance development with any athlete. With kids it is best to hold as the highest priority the goal of avoiding training bad habits and maximizing opportunities to develop good ones.

It is possible to train to improve endurance of near maximum speed indirectly by working to improve the athlete's strength, power and their ability to hold good running form when fatigued. 100-200m reps performed at sub-maximal speed while holding a good sprinting position will help athletes stay in a faster position while fatigued in races. Doing some sprint drills perfectly over longer distances than usual may also help to improve the endurance of good running form.

It is most important to always maintain focus on improving form and in developing steadily the maximum speed of the athlete. Performing training with the aim of developing endurance of high speeds always risks compromising this path.

Submaximal Speed endurance

Training to develop endurance of speeds lower than maximum avoids some of the problems

outlined above. However it is very important than an athlete rarely practises in a situation where there is loss of form. Young athletes lose form very easily because of their relative lack of stabilizing strength. Training at the various speeds that are raced over 400-1500m is appropriate. It is better to focus on shorter repetitions in training because athletes are able to maintain good form much easier for all of each run if the distance is kept short. As the athletes improve in ability to maintain good form it is then appropriate to perform training repetitions over progressively longer distances. A good session to start using with young athletes are 100m-150m runs eg 4 x 150m rest 5min focusing on 400m pace. These can be performed starting and finishing in a variety of places on the track. This is a better session than having a young athlete attempt 2 x 300m at 400m race pace because they will likely lose running form at about 200m and practise bad habits for the last 100m. It is often best with young athletes to allow plenty of recovery so that high quality of movement can be maintained. It is best to teach that the primary goal of training is to practise running nicely and is not simply suffering to improve fitness.

I have seen that it is possible for young athletes to improve their 400m performance a large amount by improving maximum speed, relaxation/rhythm at race pace, general endurance, overall strength and plyometric ability. Training regularly for specific endurance by activating the anaerobic system fully is something that is not necessary in most young athletes. When really wanting to put the icing on the cake a great short session could be something as simple as 2 x flying start 150m or 200m runs with a 3min rest between reps. This may only need to be done 2-3 times in a season combined with maybe just 6 good quality 400m races for a young athlete to perform with a good result in a 400m race.

In conclusion, it cannot be emphasized enough the importance of seeking to develop relaxation and rhythm at race speeds without fatigue effecting movement patterns.

Improvement of Technique



There is only one way to develop good technique and that is to practise perfecting it. It also means avoiding practising bad habits because that is counterproductive. However young athletes usually do not have the strength to run with perfect technique so there is a problem. The solution is to design training to minimize the opportunities to be practising bad habits and to maximize the training that develops good technical habits. The guidelines below may be helpful in creating this situation.

Guidelines for Improving Sprinting Technique.

- Practise sprinting mostly over short distances. >15.0s runners over 30m, 15.0s runners should do sprints over 30-40m, 13.0s runners over 30-50m, 12.0 runners over 30-60m etc.
- Make use of flying start sprints where the relaxed acceleration is followed by a short period of maximum speed sprinting.
- Practise Sprinting at maximum speed only when fresh and not more frequent than every 72hrs.
- Perform maximum speed sprinting only in volumes that allow the highest quality of running to be evident. Stop after the first significantly slower rep or have a much longer rest. e.g. 2 x 3 x 30m sprints
- Rest between reps 3-5min
- Practise sprinting with perfect technique at sub-maximal efforts.
- Perform drills perfectly or avoid doing them until learned properly. Do them in short perfect segments.
- Combine drills with sprinting e.g. 3s high knees cycling drill accelerating into a normal run while

maintaining the same body position and height.

- Develop the required specific strength so that the athlete can improve body position.
- See all run throughs in the warm-up as opportunities to practise running so that it can be perfected.
- Video the athletes from all angles and use it to assess if technical progress is being made by comparing footage from months earlier. There should be observable progress. Video footage is also good to show the athletes so they know what they are trying to change.
- Avoid racing fatigued and don't over-race. Either do it really well or don't race.
- Be patient and keep shaping the athlete's technique. It will take years.

Training Session Ideas

Medicine Ball

There are new varieties of bouncy rubber medicine balls that are the size of a volleyball or basketball. These can be used to do a large variety of conditioning exercises. Athletes can perform some exercises very fast and develop power especially in the mid-torso and arms. In addition, the experience of being able to train at coping with impact forces is also beneficial. They will improve the ability of an athlete to cope with rough races and have a better chance of staying on their feet when bumped. Many of the exercises are great for overall co-ordination and balance.

There are great range of exercises available at www.faccioni.com
Young athletes can do one set of 10 of each of the exercises in any of the four sessions.
<http://www.faccioni.com/fcubed.html>

Medicine Balls can also be used in Throws for maximum distance.
There are a range of throws that can be performed in training that can also be measured as indicators of increases in full body power.

Medicine Ball Testing Activity A (start with a 2kg ball progress to 3kg)

4 attempts at each

- standing underhand forward throw
- standing over the head backwards
- chest pass lunge and throw
- sideways twist and throw to the left
- sideways twist and throw to the right

My Foundation Squad does at least one session a week all year of an ever changing variety of medicine ball exercises.

Plyometrics - each activity may be part of a larger session.

Plyo Activity A

Alternate leg bounds

5 x 4 alternate leg bounds and jump into a sandpit- measure the total distance in each. rest between 3-5 min

Plyo Activity B - perform as major part of the session combine with tempo training or technical drills. Measure total distance in each

Plyo Testing

3 x 4 hops left leg

3 x 4 hops right leg

3 x standing triple jump starting from the left leg

3 x standing triple jump starting from the right leg

6 x standing long jump

3 x hop-step-hop-step-jump

Plyo Activity C - best performed at the end of a session.

Sandpit Plyo

Perform in sandpit barefoot - more of an ankle conditioning activity than pure plyometrics.

Safe to do quite large amounts of jumping in sand.

4 x 10 double leg hops - short rests

4 x 10 hops left leg

4 x 10 hops right leg

Plyo Activity D - perform early in a bigger session.

Hill Bounding

1-2 sets of 3 x 20m hill bounding rest between each 3min/longer between sets

Plyo Activity E

Hill Bound & Run

1-2 sets of 3 x (20m hill bounding +20m run) rest between each 3min/longer between sets

Plyo Activity F (advanced)

Progress from standing start alternate leg bounds to running start bounds. It is best to start with a short run up and as skill/power improves to extend the run up.

5 x 5m run up and then 4 alternate leg bounds and jump into a sandpit - measure the total distance in each. rest between 3-5min

Plyo Activity G (advanced - do not do with athletes that have not done most of the other activities)

Hurdle Hops - 2 x 3 x 3 hurdles double leg bouncing in between. Make sure ground contacts are very quick and this means keeping the hurdles very low. Initially maybe as low as 30cm. Do not progress with the height so fast that it lengthen contacts times.

Plyo Activity H (advanced)

Speed Bound Index

The athletes alternate bounds from a standing start for 30m. The number of steps taken is counted and rounded up to the nearest half. The time is also recorded from the athletes first movement to the nearest tenth of a second. The Speed Bound Index is calculated by multiplying the number of steps by the time taken. The lower the score the better.

Improvement in this score is indicative of higher levels of sprint specific power. In a session an athlete should have no more than 4 attempts.

Swiss Ball

The swiss ball can be used as a multipurpose bench, which has the training advantages of being an unstable environment. Any kind of training in an unstable environment is great for strengthening stabilizer muscles. The shape of the ball also allows for multi-angle training and allows greater range of motion on some exercises. These are important factors in properly training certain muscle groups e.g. the swiss ball crunch. It can be performed starting from a hyper-extended position over the ball. It is recommended that athletes learn the correct techniques. The best way to do this would be to attend Swiss Ball classes which are increasingly becoming a regular fixture at many fitness centres. Alternatively, there are a number of [very good video workouts](#), which explain carefully the finer points of technique and present planned sessions. I have found videos to be very effective and enjoyable for the athletes in my squad. It is important to recognize Swiss Ball training as a way of improving functional strength and not just a toy for improving balance etc.

Kids love doing exercises on Swiss Balls choose a range of exercises, learn to do them properly and perform just 10 exercises of each.

Pilates

The Pilates variety of exercises have been an integral part of ballet training for many years. The basic principles of Pilates conditioning are to make people more aware of their bodies as single integrated units, to improve alignment and breathing, and to increase efficiency of body movement. The method consists of a sequence of carefully performed movements with some carried out on specially designed equipment. Each exercise is designed to stretch and strengthen the muscles involved accompanied by a high level of focus on learning to relax. Athletes in my squad that have done a significant amount of pilates have exhibited improved body awareness and control. I have noticed that they are able to learn to do drills much

easier than other athletes. I also believe this area of training is exceptionally good for enhancing hip mobility and mid-torso strength.

Pilates can be done at studios where it is common to have personal tuition or there are a variety of good video workouts of floor exercises. My squad do Pilates video workouts at least once a week all year, one good one combines Pilates with some yoga stretching it is called a [Mat Workout Based on the Work of J.H. Pilates by Denise Austin](#).

Gym

The young athletes in my squad do good variety of exercises using Weights.

Some of the exercises I have found good are:

Step-Ups. There is a distinctive way to perform Step-ups that is a good test of stabilization ability. They are performed on alternate legs with the lower leg kept close to vertical throughout the movement. Executed this way they target the glutes more than when the knee is allowed to move forward and are a good specific hip extension exercise. Often when Athletes start training with this exercise they have great difficulty in staying tall and maintaining level hips. There is a great tendency to 'wobble' or 'twist' on the way up. This indicates that they have weak stabilizers. Athlete progress is clearly limited by their ability to stabilize the weight. So this is a good way to measure improvements in stabilization strength. Athletes usually display the gains from other training methods that impact upon stabilization by improving in the perfect execution of this exercise more rapidly.

Young kids can start step ups on a low box without a weight progressing to a box that is not so high that it causes their upper leg to be lifted above parallel. Then add a barbell weight and progress within the obvious limits of the athletes stability. Do 3 sets of 8 each leg.

Squats

It is a good idea to start doing squats without any load. Aim for the athlete to go as low as possible but maintain their knees over the shoes(not in front) and also to keep their head up so they can maintain a flat back, this is important for safety. Some gyms have a smith machine which can provide a guided action of the load and is a safer way to start resisted squats. Deeper squats are good for glute development and partial squats are good for improving the athletes ability to maintain a higher position in the support phase.

Standing Vertical Dumbbell Presses - The athletes stand tall with good posture and have to focus on maintaining this position throughout each set. If they cannot stand tall they are lifting too heavy. Do 3 sets of 6 -10.

Chin-ups - Athletes develop the ability to do 3 sets of chinups for as many as they can do. If they can't do any then they can do standing lateral pulldowns on a machine that uses a cable.(3 sets of 6-10)

Standing Upright Rows - The Athletes stand tall with good posture and hold a barbell near the middle and lift it to the height of the base of their neck. If they cannot maintain their ability to stand tall they are lifting to heavy. Do 3 sets of 6-10

Exercise choice - There are many other exercises that can be used that are good. I have read some research that recommends against using isolation exercises like hamstring curls, knee extension or leg press. The argument is that these exercises are training muscles in a way that is not the way the muscles function when moving. Some even consider that these exercises may increase the risk of injury. I consider them appropriate for rehabilitation or at best for basic general conditioning. My squad rarely ever do these exercises.

Theraband exercises

Therabands are thick flat rubber bands that can be purchased in a roll. They exist in a number of resistance grades. Many stabilizer muscle groups can be specifically strengthened using them.

A few examples are:

1. Cut a 90cm length, and tie the ends. Get the athlete to step into the theraband circle (band around ankles) and get them to do a series of sumo type walks (squat position with wide legs). Get them to walk sideways, forwards and backwards lifting each leg up (like sumo wrestlers do) and not allowing the theraband to pull their legs together. It is recommended to do one set of 15-25 steps.
2. The athlete lays face down with the theraband around their ankles. They then get into a hyperextended position and abduct their legs. It is recommended to do 1-2 sets of 20.
3. Hip Rotators can be strengthened by having the athlete lay face down, knees together with the lower legs held vertically and placing the Theraband around their ankles. The athlete should then maintain the knees together and rotate their hips so that their ankles move outward. A similar exercise can be devised to strengthen rotation in the opposite direction.

Often there are big differences in the strength of outward movement and the inward movement. Strengthening and equalizing hip rotator strength should improve stability and improve running form especially when fatigued.

Hill Training



Hills can be used in a variety of ways. They are good for developing strength in the running action. Athletes can do starts running up slight hills, they could bound 20m or they could do longer runs up hill for endurance. The most pleasant type of hill is to use a hill that varies in slope and winds slightly as it climbs in a natural setting.

Hill Training Acceleration Activity A
4 x 20m starts - full recovery

Hill Training Power Activity B
4 x 20m alternate leg bounding - full recovery

Hill Training Endurance Activity C
4 x 80m rest between 2min

Hill Training Endurance Activity D
2 x 800m hill on slight slope gradually going faster - walk down recovery

Hill Training Strength Endurance Activity E (Advanced)
2 sets of 3 x (20m bound + 20m run + 20m bound) recovery 90s and 8min between sets.

Downhill Training

Running down very slight slopes is also a good way to practise good technique. When running downhill it is very obvious to the athlete when they are overstriding. The goal should be to run with a smooth action and to do this the athlete has to practise maintaining dorsiflexion and making ground contact well underneath the body.

Downhill Training

4 - 6 x 60m relaxed with smooth impacts on a very slight smooth grassy slope. recover between 3min

Combined Hill Training

3 laps of (hill run up gentle slope - 30m bound up steeper hill - 100m slow jog - walk down steep hill - fast smooth running on gentle downhill - jog across to bottom of hill)
Do these continuously at a manageable intensity. Aim for quality bounding on each lap.

Sprinting Technique Development



Sprint Drills

Drills aim to specifically strengthen the muscles in postures and actions that are similar to those that occur during the sprint action. They are posture drills, specific strength drills and functional flexibility drills all at the same time (Gambetta et al.). It is very important that correct execution of the drill be trained carefully with coach feedback essential. This is because drills performed incorrectly can ingrain bad habits that will result in the opposite of the intended effect. Bad drills are much worse than not doing drills at all. Athletes should never perform them as relaxed warm-up activities unless they are done perfectly. They are as serious a business as a concert pianist practising piano.

I have the athletes in my squad simply concentrate on two drills:

1. Ankling - circular movements of the lower leg maintaining dorsiflexion, striking with a backward moving (active) foot. They do 6-8 of these over 6-8s every time they warm-up.
2. Quick Recovery High Knee Running - they catch their leg early bring it rapidly up underneath stepping over the height of the other knee. They keep their pelvis stable lift their knees as high as they can without 'sitting'. They do these aiming to perform them with perfect form. This means maintaining constant lumbar curve, avoiding 'sitting' or losing dorsiflexion before impact. The positive cues are to stay high, step over opposite knee

and land flat footed. They do about 6-8 of these over 6-8s at varying tempos and transition out of them into the normal sprint action for about 15m.

Sprinting - Maximum Speed Development

Athletes perform all runs in these sessions one by one. This is so that they can practise thinking about their movement by themselves without distraction. It is too easy for athletes when they have someone else near them in another lane to compete and not think about how they are moving.

Just choose one kind of session to perform on a given maximum speed training day from something similar to the following.

Max Speed Activity A

30 - 40m sprints from a 3 point start. Aim to do up to 6 with 3-5min rests in between. Only do as many as the athlete can perform with absolute best times. (We time them starting the watch from their first foot movement). As soon as they have become significantly slower this part of the entire training session should end. It is possible to do 2 sets of 3 with 3-5min rest between sprints and a longer but active break between sets. Times from the athletes first movement over 30m & 40m can be converted to potential 100m times e.g on a Mondo Track

30m	40m	100m
3.93	5.04	12.00e
4.09	5.25	12.50e
4.25	5.46	13.00e
4.42	5.67	13.50e
4.58	5.88	14.00e
4.74	6.09	14.50e
4.91	6.30	15.00e
5.07	6.51	15.50e
5.23	6.72	16.00e
5.40	6.93	16.50e
5.46	7.02	17.00e

Max Speed Activity B

Flying start sprints the athletes should accelerate gently for about 25m then sprints maximally across a 15m zone. The goal is to create the highest speeds possible over what will be about a 2s duration. Aim to do 2 sets of 3 with 3-5min rest in between and an active recovery in between sets.

Max Speed Activity C

in's and out's the athletes should accelerate gently for about 25m then sprints maximally across a 15m zone this is called the "in" then they should freewheel maintaining stride frequency for 15m this is the "out" before performing another 15m "in". Aim to do 4 with a 5min rest in between.

Max Speed Activity D

Sprint Conditioning

40m sprints at 95% effort - practising good form and relaxation. Do 2 sets of 4-5 with a recovery of 90s between reps and a longer active recovery between sets. Important to do no running at maximum effort.

Ideas and possible variations are to:

- always have the athletes do maximum speed sprints with the wind. Running against the wind is a strength activity.
- have the athletes do some sprinting on a bend where they focus on keeping their left hip high.
- occasionally do a small amount of plyometrics between each sprint.

Starts & Acceleration

Young athletes are not strong enough to start properly but it is still important for their performance to be able to react to the gun and accelerate with the right technique.

Acceleration Activity A

Block starts

Perform 4-6 x block starts over 15m. rest between 3min

Focus on keeping eyes looking down at track head down, using a big arm action and pushing. The goal is to have an entire body that is leaning forward significantly and being held up by the strong forces being exerted from the legs as a pushing action. These are best done with competition. It is important for the starter to vary the pause and deter athletes from guessing the gun.

Acceleration Activity B

Resisted acceleration.

The coach or an able assistant faces the athlete and resists them as they try to accelerate by pushing against their shoulders. It is important to have the athlete leaning forward through their whole body as they do this. It is also fun and effective to have the resisting partner release tension on the athlete which allows them to display a subsequent brief burst of speed.

Acceleration Activity C

Gun Reaction Drill

The athletes should get down on all fours and practise moving their arms like they will when the gun is fired. e.g. If an athlete has their left foot forward in the blocks then their left arm should swing forward and their right arm backwards. Athletes should practise this so that it becomes automatic that they react to the gun without having to think about it as much.

Acceleration Activity D

Plyo then accelerate

Athletes do 4 alternate bounds then sprint 20m. Repeat 4 times with 3-5min in between.

Speed Endurance Training

Tempo Sessions

These are opportunities to practise good technical form and relaxation. They develop a sense of rhythm in the athlete. They can be done over any distance but the main rule is to avoid producing form that would effect running form. Tempo sessions are great way to practise running and are very important for the long term development of the athlete.

Tempo Activity A - Athlete should maintain relaxation throughout all runs. "Speed that comes Easy".

4 x flying start 60m rest between 3min
active recovery 10min e.g. Med Ball
4 x flying start 100m rest between 5min
active recovery 10min e.g. jog
4 x flying start 60m rest between 3min

Tempo Activity B - Athlete should maintain relaxation throughout all runs. "Speed that comes Easy".

4 x flying start 150m rest between 3min

Tempo Activity C - Athlete should maintain relaxation throughout all runs. "Speed that comes Easy and is variable"

6 x 100m changing speed slightly every 20m rest between 3min

Tempo Activity D – Form runs with exercises between reps.

4 x 4 x 60m aiming for ideal body position – big arms – full strides but at 70% effort with a 1min rest then exercises just before each run. We have been doing for example:

- South end
 - pushups on one leg for x 5 each leg
 - supermans x 15
- North end
 - crunches x 15
 - On knees sideways knee lifts (Lamp posts) x 10 each leg

This is a total of 160 pushups etc and a great challenge to good form even when runs are done at 70% effort.

Speed Endurance

To develop the endurance of speed at race speeds it is best with kids to develop this in races but there are some sessions that are also good. It is important not to do these types of sessions very often in young kids because the priority should be to develop absolute maximum speed and improve running technique. Always the athlete should be striving to run with as good a form as possible.

Speed Endurance for 100m Activity

2 x 2 x flying start 60m rest between sprints 2min and 10-15min active between sets.

Speed Endurance for 200m Activity

2 x 2 x flying start 100m rest between sprints 3min and 10-15min active between sets.

Speed Endurance for 400m Activity

2 x flying start 200m with 3min rest between sets. Have a 15min recovery and then the athlete could do 3 x flying 60m relaxed at 400m pace with 3min rests.

Endurance Drills

Once athletes are capable of performing sprint drills technically well they can then perform them over longer durations as a way of improving the endurance of holding good body position. The athletes in my squad do our version of the high knees drill in segments totalling up to 200m. They only go as far as they can hold good technique in each segment. I have seen great gains in the ability of the athletes to hold good form come from this area of training. The caution is never to have an athlete use drills in this way until they technically proficient at them or they will be practising bad habits.

Novelty Training

Carrying balls

Athletes run carrying a 2kg med ball in front of their chest at a relaxed speed. Aiming to minimize the wobbling that occurs when no arm action is happening to aid in balance. This teaches them that the function of arm action is also to balance. It may help eliminate the bad habit that many athletes have of swinging their arms in a way that increases trunk lateral rotation. Athletes could also practise running with no arm swing and also with very minimal arm swing.

Foam rollers

Athletes can use foam rollers to train the core in a way that aids balance. These can also be used to stand on while throwing and catching medicine balls as an extra challenge to balance. Kids find this to be a lot of fun.

Skateboard Riding/Scootering

These activities are both similar to the active foot action used in running and they are great for developing the strength of the stabilizer muscles. Athletes will find that they fatigue quicker in the leg on the scooter or skateboard and not the one hitting the ground. It would be good if athletes that ride scooters or skateboards develop the ability to ride using either leg and do them in equal amounts. Then riding scooters and skateboards will likely have a positive effect on their running. This is as long as they avoid injury from crashes of course!

Rollerblades, Ice Skating and Rollerskating.

Most skaters have great postures this is because skating develops the strength of the upper glutes (glute medius) and also the adductors. These are very important muscles for stabilization. Skating is a great way to develop better balance, stabilization and strength in the important glute muscles. If you think that the top 100m sprinters have big glutes check out the posteriors on the speed skaters!

Rope Skipping

Almost any sort of skipping rope type games are good. Maybe best done in short segments with more difficult to master activities preferred. Once again like with all plyometrics avoid trying to jump in a way that prevents the heels from touching the ground.

Play running

Skipping, backwards running and combinations of various ways to move are also great for adding another different physical and neural stimulus.

Some ideas would be to expand the use of movement play in the warm-up period. This can truly be what is called a mixed warm-up by having athletes use and develop a great range of different movement skills. Skipping, Karioka, Side-steps, backward running, lunge walking etc.

Technical Practise

Baton changes - It is fun for athletes to work in pairs to improve their confidence and effectiveness in relay baton changes. Many athletes first taste of success is in relays so it is worth practising.

Hurdle Drills - Hurdle Drills are very good for improving hip mobility and stabilization of the trunk. Young athletes find it fun to learn how to do them and practise. Short hurdle races are also fun for athletes to do in training.

Hurdle Walking

The athlete walks over six or eight low hurdles setup at about one metre spacings. Stand just before the first hurdle, lift the lead knee up very high and place the lead leg vertically down on the other side of the hurdle. The lower part of the leg should not reach out in front of the body. Bring the knee of the trail leg out to the side to above hip height with the foot pointed outward to clear the hurdle. Bring the trail knee across the hurdle and as the trail knee clears the hurdle bring the knee up and to the front centre of the body. Move the trail leg vertically down on the other side of the hurdle. The lower part of the leg should not reach out in front of the body. It is important to maintain high hips throughout the action and use a good range of arm movement. These drills can also be done with the extra challenge of holding a ball with straight arms above the head.

Hurdle walking can also be done backwards with one step between and also combinations of forwards and backwards is a good novelty.

Mobility Drills

Leg swing drills

1. Leg Swings. Stand holding onto a wall for balance with one hand. Swing a leg forward and backward 10-15 times. Repeat with the other leg.
2. Inward and Outward - Place both hands on a wall for support. Swing a leg out away from the body and back across the body 10-15 times. Repeat with the other leg.

Hurdle drills

Lateral Leg Lifts. Stand at the end of a hurdle, with our body slightly to the left of the hurdle. Keeping your right leg straight, lift it up and over the hurdle. When your right foot hits the ground, lift your left leg and circle it over the top of the hurdle. Pause and step back across the hurdle with your left foot first. Start with 3 sets of 5 reps in each direction and build to 3-5 sets of 10. There is a variation of this drill where the athletes does the same action with legs that are bent. This creates a situation where there is a higher knee lift.



Lower leg conditioning

Many athletes have trouble with lower leg injuries as they mature and especially if they are training really hard at any stage in the future. It is a good investment of time to perform as much pre-habilitation exercises as possible. The muscles of the shin, foot, ankle and calf can all be conditioned in a variety of ways to make them more resilient.

One simple way to condition the lower legs is to do heel/toe walking at the end of most training sessions. For all but the most important competition part of the year. My squad twice weekly do 2 sets of:

30m walk on toes as high as possible

30m walk on heels with toes pulled upward toward shin as high as possible.

30m walk on toes as high as possible with toes pointed outward.

30m walk on heels with toes pulled upward toward shin as high as possible with toes pointed outward.

30m walk on toes as high as possible with toes pointed inward.

30m walk on heels with toes pulled upward toward shin as high as possible with toes pointed inward

30m on the outside of the feet.

These are best done barefoot where possible. Barefoot walking & play is a good way to condition the feet. Staying in shoes all the time allows condition of the feet to deteriorate and will likely eventually in foot/lower leg injury such as plantar fasciitis.

Stretching

I believe it is best for all athletes at any age to follow a personalized stretching program designed by a physiotherapist but teaching some important stretches is also valuable in training. It is important that athletes know how to do it properly. Combinations of some dynamic stretches and static stretches are appropriate. Muscle Physiology researchers now believe that static stretching does not decrease the risk of injury pre-competition or pre-training. Some research has shown a slight increase in injuries among athletes that stretch statically pre-event. My squad do loosening up activities involving the use of accupressure and then a mixed movement warm-up. They do static stretching mostly at home that is designed for them personally and a small amount after training.

Planning

So much of sprint training is training the nervous system and optimizing body position maintenance. It is more valuable to work on improving maximum speed and acceleration in developing athletes than it is to take shortcuts and work primarily on speed endurance.

Planning a Training Week

The spacing of certain types of training activities needs to be carefully thought through so that maximum quality can be produced in the athletes training. Physiological and Nervous system freshness is essential if athletes are going to develop good technical habits. Also young athletes should be fresh for most competitions that they plan to perform in. The following are guidelines to help with the planning of athlete training.

In the Off-season:

- No more than three in total of maximum speed sessions OR plyometric activities per week that are spaced 72hrs apart.
- At least one day a week where there is no running.

e.g.

Mon - Track Session – Tempo with exercises
Tue - Pilates or Swiss Ball
Wed - Track Session – Max Speed + Med Ball
Thu – Gym + easy tempo
Fri - rest
Sat – Plyometrics + Hills + Tempo
Sun - Jog + Pilates or Swiss Ball

If racing in low key meets:

- One maximum speed session per week that is at least 72hrs before competition.
- No more than one plyometric activity per week that is at least 48hrs before competition.
- At least two days a week where there is no running.

e.g.

Mon - Track Session - Max Speed + Med Ball
Tue - Pilates or Swiss Ball
Wed - Track Session – small amount Plyometrics + Starts+ Tempo
Thu - Gym
Fri - rest
Sat - Competition
Sun - Jog + Pilates or Swiss Ball

In the 5 days before major competitions:

- No maximum speed sessions.
- No plyometric activities.
- At least 2 days of no running.
- Small numbers only of starts. eg 3-4 starts
- No Gym training

e.g.

Mon - Track Session - 3-4 Starts to 20m + Med Ball

Tue - Pilates or Swiss Ball

Wed - Tempo - small volume eg 4 x fly100 relaxed at 80%

Thu - Warm-up and Drills only

Fri - rest

Sat - Major Competition

Sun - Pilates or Swiss Ball

Planning for Team Sports

Team sports players need to continually develop technical skills. They also need to devote quality time to speed and endurance development. Coaches need to design the best program for the athletes which is the most balanced compromise. The following ideas may help.

- Work on speed development once a week for most of the year. Do it in small volumes over a distance that allows high quality e.g. 30m sprints or a flying 15m zone.
- Players speed can improve the most from working on improving the power of their stride. This can be developed to a great degree over a long period of time using strength training techniques particularly weight training.
- Uphill bounding is a great way to improve the power needed for acceleration. Do maybe 10 x 40m with 20m bounding the 20m running once a week for 12 weeks and measure the effects on first movement 30m times.
- Do a mixed warmup and then max speed sprinting at the start of training before any fatigue is apparent. Just 3 x 30m sprints at max speed is enough to help develop more speed.
- For fitness do relaxed tempo 60m runs with exercises just before each run. Maybe do 4 sets of 4 x 60m with 1min rest after each rep before starting the exercises and 3min between sets. Choose exercises that fatigue the mid-torso, hips and glutes.
- In team sports there is a great need for repeated sprint ability so train this way. Do lots of short sprints even if they are not at maximum speed.
- Training primarily for speed endurance may improve 100m sprint performance but will inhibit the development of maximum speed.
- The best time to do mid-torso training, heels/toes, sandpit bounces and hip mobility drills is at the end of a session.
- All team sport games that involve jumping should include small regular amounts of plyometric training in their sessions and also be implementing strength training methods that target the development of eccentric strength. Jumping without preparation is inviting injury.

Recommended Resources

Training Kids for Speed - Video on CD

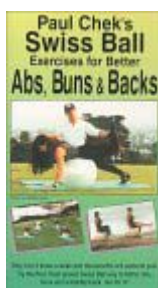
Includes footage of many of the ideas presented in this book.

<http://www.oztrack.com/kidspeedcd.htm>



Paul Chek's Swiss Ball Video 'Better abs,buns & backs'

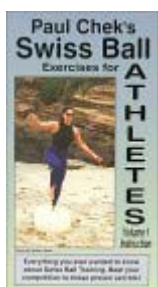
<http://www.amazon.com/exec/obidos/ASIN/B00004TQ18/sydney2000trac00>



My squad do this Swiss ball workout 2-3 times a week for most of the year.

Paul Check's Swiss Ball Exercises for Athletes Vol 1 – VHS

<http://www.amazon.com/exec/obidos/ASIN/B00004TQ19/sydney2000trac00>



Excellent Training Video Series that shows how to train using a Swiss Ball for best effects.

Paul Chek's Swiss Ball Exercises for Athletes Vol 2 - VHS

<http://www.amazon.com/exec/obidos/ASIN/B00004TQ1A/sydney2000trac00>



Excellent Training Video Series that shows a full Swiss Ball workout that is performed using the right methods.

Denise Austin - Mat Workout Based on J.H. Pilates (2000)

<http://www.amazon.com/exec/obidos/ASIN/0784018235/sydney2000trac00>



This video contains 2 x 20 minute workouts - They are great to incorporate with other workouts or use alone when time is limited. Workout 1 is all pilates. Workout 2 combines yoga and pilates. My squad does this 2-3 times a week.

How to strengthen the lower parts of your legs, and prevent (or repair) shin-splint problems.

by O. Anderson and W. Reynolds

<http://www.pponline.co.uk/encyc/0161.htm>

Back to Basics

by Vern Gambetta

To do with development of children and physical activity

<http://www.gambetta.com/a97001p.html>

Functional Balance

by Gary Gray and Vern Gambetta

Ideas to do with balance training

<http://www.gambetta.com/a97002p.html>

Too Loose Too Much

by Vern Gambetta

The truth about stretching

<http://www.gambetta.com/a97003p.html>

Following the Functional Path

by Vern Gambetta and Gary Gray, PT

Functional training explained

<http://www.gambetta.com/a97004p.html>

Leg Strength for Sport Performance

by Vern Gambetta

The functional way to strength train legs

<http://www.gambetta.com/a97006p.html>

Learning to Move

by Vern Gambetta

<http://www.gambetta.com/a97007p.html>

Plyometrics: Myths and Misconceptions

by Vern Gambetta

<http://www.gambetta.com/a97008p.html>

Neuromuscular adaptations following prepubescent strength training.

Ozmun, J. C., Mikesky, A. E., & Surburg, P. R. (1994).

<http://www-rohan.sdsu.edu/dept/coachsci/vol66/ozmun.htm>

Strength Training for Children

by J. Graham

<http://www.faccioni.com/Reviews/childstrength.htm>

The Use of Medicine Balls for Speed & Power Development

by A. Faccioni

<http://www.faccioni.com/Reviews/medballtraining.htm>

The Role of the Mid-Torso in Speed Development

by A. Faccioni

<http://www.faccioni.com/Reviews/midtorsospeed.htm>

Plyometrics

by A. Faccioni

<http://www.faccioni.com/Reviews/plyometrics.htm>

Dynamic Warmup Routines for Sports

by A. Faccioni

<http://www.faccioni.com/Reviews/Warmup.htm>

Speed Training for Team Sport Athletes

by A. Faccioni

A range of good ideas

<http://www.faccioni.com/Reviews/teamspeed.htm>

Pilates ReTraining of Lumbar Stabilisation Muscles

Some explanation of value of Pilates exercises

<http://www.faccioni.com/Reviews/pilates.htm>

USA Sprint Tech Info.

by Adrian Faccioni
(Power Point Presentation)
486Kb zip file

Brilliant description and analysis of modern sprint biomechanics and training.
<http://www.faccioni.com/articles/USA%20Speed%20Presentation%202000.zip>

The Inner Unit - A new frontier in Abdominal Training

by Paul Chek
Great article

<http://www.coachr.org/innerunit.htm>

The Outer Unit

by Paul Chek
Great article outlining importance of specialized core conditioning

<http://www.coachr.org/outer.htm>

The Use Of Swiss Balls In Athletic Training- An Effective Combination Of Load And Fun

By Klaus Bartonietz, Germany, and Debbie Strange, New Zealand
Some explanation of value of Swiss Balls

<http://www.coachr.org/sb.htm>

Young Athlete Conditioning

by Adrian Faccioni and Di Barnes
Excellent article

<http://www.faccioni.com/lectures/juniorcondition.PDF>

'Run-Play' Training

Some Creative training ideas

<http://www.pponline.co.uk/encyc/0272.htm>

Proceedings of the Conference on Strength Training & the Prepubescent

Information about safety of strength training for kids

http://www.sportsmed.org/Publications/..%5Cpdf%5Cstrength_training_prepubescent.pdf

Why sprinters should cock their ankles

Explanation of Dorsiflexion

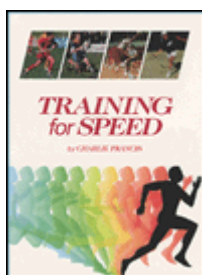
<http://www.pedigest.com/sample/biomechanics.html>

The Simple Secrets of Developing Great High School Sprinters

by Bryan E. Hoddle
Some useful ideas and explanation

<http://www.watfx.com/TF/TF%20Education/Hoddle1.htm>

Training for Speed by Charlie Francis

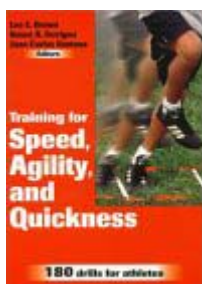


A recommended book on Sprinting. Contains plenty of great sprint training ideas. Written by the coach of Ben Johnson who ran 9.79 for 100m in the Seoul Olympics. More information at <http://www.oztrack.com/Francis.htm>

Speed Agility and Quickness

by Brown, Ferrigno and Santana

<http://www.amazon.com/exec/obidos/ASIN/0736002391/sydney2000trac00>



Heaps of ideas for activities that develop Speed, Agility and quickness.

Training for Speed and Endurance

by Peter Reaburn (Editor), David Jenkins (Contributor)

<http://www.amazon.com/exec/obidos/ASIN/186448120X/sydney2000trac00>



The contributors to Training for Speed and Endurance are sports specialists keen to bridge the gap between laboratory findings and athlete preparation. They are all involved in the training and preparation of elite athletes, and their aim in writing this book has been to provide practical guidelines for developing and maintaining speed and endurance fitness for both individuals and team players. Training for Speed and Endurance will make sense of all the new techniques and the latest research. It will be of interest to anyone wishing to gain up-to-date information on training principles and will be of particular value to those individuals or team players who need to focus on speed and endurance. The book is an excellent resource

for coaches, individual athletes, health and physical educators of senior students, and tertiary students of sports science.

Sprints & Relays : Contemporary Theory, Technique and Training

by Jess Jarver

<http://www.amazon.com/exec/obidos/ASIN/0911521429/sydney2000trac00>



Great compilation of recent research to do with Sprints & Relays.

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