Greased Lightening

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The importance of speed in athletics cannot be overstated. Oddly enough, there's a common misconception that just going out and sprinting is the *best* way to improve one's speed. In reality, coaches and athletes need to understand that unless the speed training is performed correctly, individuals will never truly optimize their performance. With that in mind, let's break down linear and lateral movements and how to teach them to your athletes.

Motor Skill Development

Many people think that athletes are genetic freaks capable of making superhuman feats look easy because they possess unworldly speed and outstanding genes. It is important to realize, however, that we are all athletes and can perform anything if we work at it. The difference between high level athletes and the average athlete is the nervous system. High level athletes have highly tuned nervous systems that can call upon their muscles to perform a movement very efficiently. The goal of training is to improve the efficiency of motor unit recruitment.

When athletes listen to an explanation of a new skill and then observe demonstrations of the skill, they begin to develop motor programs for that skill. A motor program is an internal representation of the skill - similar to a computer program - that contains a set of instructions to perform the movement. These instructions are written in the language of the athletes' nervous and muscular systems and allow athletes to begin practicing the skill. At first the new motor program may be quite crude and contain some errors. However, with practice and feedback, both from the athletes' sensory systems and from the coach, the motor program is revised and refined so that it gradually becomes more effective at controlling performance.

Teaching technique is a vital step in making athletes more efficient. To totally understand how a movement pattern is established, it is important to go over the phases of motor skill learning. The first phase is the cognitive or beginning phase of skill learning. An athlete focuses on gaining an understanding of how the skill is to be performed; this phase is characterized by conscious attention to the details of the movement. The next phase of motor skill learning is the associative phase. During this phase, the athlete practices the skill to the point that it is performed both accurately and consistently. With proper practice and feedback, the athlete's motor program for the skill will become better developed than it was in the cognitive phase of learning. The athlete will not have to focus much attention on the movements themselves, but can start to incorporate more of the surrounding environment into play. The final phase of motor skill learning is the autonomous phase. During this phase, the athletes can perform the skill with perfection. The skill is automatic and requires very little conscious thought. In fact, conscious thought may actually interfere with the performance of the movement. Since the movement is performed flawlessly, the athlete can concentrate more on external stimuli such as an opponent or strategy.

Teaching Movement vs. Timing Movement

The speed at which an athlete performs a particular movement skill is irrelevant when teaching new skills. The important points are to teach athletes to move in the most biomechanically efficient manner possible to foster solid motor programs in the athlete. Other coaches prefer to spend their time coming up with a variety of different agility and speed drills and focus on how fast athletes can get it done, while I think it is more important to perform a lesser variety of drills over and over until it becomes automatic. Each drill becomes progressively harder over time, but the same underlying concepts are taught throughout. I believe in teaching and learning skills slow and perfect before fast and sloppy. If athletes can be taught to move

efficiently and properly, they won't waste energy and will ultimately be better prepared to succeed. That is why movement training should always be performed in a state of very little fatigue. Proper technique must be enforced and encouraged. Don't let athletes settle for performing drills with improper technique; when coaches do so, they are doing their athletes an injustice.

It's All in the Shins

Teaching athletes to become more efficient with their movement training comes down to simple physics. Newton's 3rd law of motion explains how to accelerate and decelerate. It is stated:

For every action there is an equal and opposite reaction.

In other words, "the statement means that in every interaction, there is a pair of forces acting on the two interacting objects. The size of the forces on the first object equals the size of the force on the second object. The direction of the force on the first object is opposite to the direction of the force on the second object. Forces always come in pairs - equal and opposite action-reaction force pairs (5)."

Now what does this mean to increasing our movement skills? It means that to move in a particular direction we must apply force in the opposite direction of our intended direction and the more force we apply back to the ground the more the ground will push back at us. Let's take a look at straight-ahead sprinting. If we want to move forward, we have to push in the opposite direction (backwards) with a great amount of force to cause an acceleration of the body. If we wanted to go up (vertical jump), we have to push straight down into the ground, and the same applies for lateral movement. To teach this concept to athletes can be difficult, especially if they aren't familiar with the underlying physics. I always teach my athletes how to properly apply force into the ground in order to accelerate and decelerate. The simplest way to get this point across is to look to your shins. When we accelerate we have a positive shin angle (small angle between shin and foot), and when we decelerate we have a negative shin angle (large angle between shin and foot). A positive shin angle is less than 90-degrees, while a negative shin angle is 90-degrees and greater. This shin angle allows our bodies to be in the most efficient position to apply force into the ground, whether we are moving forward, backward, or laterally.

Positive Shin Angle

Negative Shin Angle

Linear Movement Training

Linear movement training (LMT) is also known as straight-ahead speed training. As the name implies, the goal of LMT is to increase straight-ahead speed. Most field sports hardly ever require athletes to run in a

straight line; nonetheless, it is imperative that athletes know how to sprint properly. LMT also helps to improve general athleticism, and assists with lateral movement training (LAMT).

The first thing to learn when first learning sprinting technique is the PAL system. PAL is an acronym coined by Vern Gambetta, which stands for **P**osture, **A**rm Action, and **L**eg Action. Teaching sprint mechanics can easily be broken down into these 3 components. Initially drills should focus on each of these separate components. As the athletes' level of skill increases, more integrated drills should be incorporated into the movement sessions.

Postural Drills

The best drills to teach proper posture for acceleration are wall drills. Stand about 3-4 feet away from a sturdy wall. Lean into the wall so that your arms are straight, torso is at a 45-degree lean, and heels are off the ground. Raise your right knee and toe up, with the heel directly underneath the butt. If there is lumbar flexion noted, the knee has come up to high. This starting position is the same for both wall marches, and wall switches.

Good Wall Posture

Bad Wall Posture

Wall March: From the position described above, begin with your right knee up in the air. Cue to pull the toe up every time the knee comes up, and make sure the heel is right under the butt, when the knee comes up. On the coaches' command the athlete is to drive their foot back and into the ground hard so that they will rise up to their toe or even pop up off the ground. The foot should hit directly next to the foot on the ground and under the hip. Look to see if the athlete gets triple extension of the ankle, knee and hip. Perform 5-10 reps for one leg, and then switch to the opposite leg. This drill also works on leg action.

Wall Switches: From the same position as above, begin with your right knee up in the air. On the coaches'

command (same cues as in the wall march) the athlete is to switch legs, so now the left knee is up and right is on the ground. The athlete is to maintain the same postural position as he switches legs. Begin with a single switch, and it can progress up to 5 switches. The athlete is to hold the position until the coach tells them to relax. The key thing to look for is to make sure that the knee and toe come all the way up each time and not just on the last rep. You will see some athletes that will do that just to make the drill look faster.

Arm Action: Arm action is an important part of sprinting that many athletes perform poorly. An arm action drill is always a staple in our LMT, because it needs to be constantly reinforced. The cues of teaching arm action are very simple. The shoulders need to be relaxed and with very minimal tension. The arm should be at a 90-degree angle between the upper and lower arm, and movement should occur at the shoulder. You will notice that many athletes will extend their elbows; this should be discouraged. When athletes extend their elbows, they are creating longer lever arms, which take more time to move than shorter lever arms. The easiest cue is to tell your athletes to drive their elbow back behind them. The arm should be straight back and forth with very minimal side to side movement. The hand should move from the chin to hip pocket.

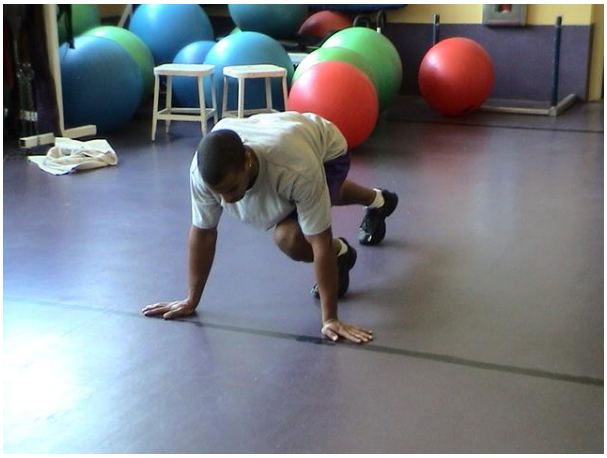
Seated Arm Action: The athlete begins sitting on the floor, with their knees pulled in slightly. They should maintain an upright posture, with the chest out and shoulders back. Arms should be at 90-degrees and movement should occur at the shoulder. Begin with slow arm action, so that the athlete is performing the proper movement pattern. As they improve, increase the speed to a point where they are actually bouncing up off the ground.

Standing Arm Action: This is performed the same way as on the floor except now the athlete is in a more specific position. Begin slowly and then increase speed as proficiency increases.

Leg Action: Proper leg action is key when teaching acceleration. First and foremost, a coach should always look for a positive shin angle. Also, make sure that as the knee comes up, the toe of the same leg is dorsiflexed (up) and the heel is underneath the butt. Leg action during acceleration should be a pushing action, where the foot is pushed down and back into the ground to propel the body forward.

Mat Jumps: This is a great drill that I learned from Strength Coach, Jeff Oliver to teach athletes triple extension. Begin in a pushup position in front of a mat that the athlete can jump onto. One knee should be pulled into their chest, and the back should remain flat. On the coach's command, the athlete should drive off the leg that is pulled up and extend their body completely so they land on the mat. The coach should look for complete triple extension of the lead leg.

Pushup Starts: This drill is a progression from the previous drill; the athlete begins in the same position without the mat. On the coach's command they now sprint 5-10 yds, with the same pushing emphasis that they used on the mats. The key to look for is that the athlete gets full extension off the lead leg on the initial push *before* the trail leg comes through. If the athlete cannot fully extend the lead leg, before the trail leg comes through, then more glute and hamstring strength work needs to be done.



LMT Progression

Acceleration should be emphasized when teaching LMT, because that is what most athletes need. Most athletes rarely reach top speed in competition and it should therefore not be the primary emphasis in workouts. When progressing from one phase to the next it is important to start with short distances and increase distances as technique improves. For example, when performing short acceleration sprints, begin with 10 yds sprints, then progress to 15 yds, then progress to 20 yds, and so on.

Lateral Movement Training

Lateral Movement Training (LAMT) is also known as agility or change of direction training. This type of movement requires athletes to decelerate and accelerate in a variety of directions: conditions specific to most sports. Many coaches develop this aspect of performance with mini hurdle and cone drills, but neglect to actually teach athletes how to decelerate properly and change direction in the most efficient manner possible. If you've ever played football, you remember doing those awful bag drills, where you run laterally over them and were barked at to get your knees up higher. The bags had the right idea of improving lateral movement, but when moving laterally in sport, athletes never have to pick their knees up very high. They keep their feet low to the ground and take short, quick steps that emphasize pushing – not high-stepping - in either direction. Take a look at any linebacker positioning himself to make a tackle, basketball guard playing defense, or tennis player awaiting a serve and notice if they're picking their knees up while moving laterally.

To teach proper lateral movement, coaches must first teach athletes the basic athletic position. This requires the athlete to have their feet about shoulder width apart, butt back, knees bent, chest out, back flat, and looking straight ahead. This position teaches athletes that their weight should be distributed equally. The only difference we are going to make this position to make it more effective to move laterally is to point the knees in slightly (internally rotate femur). This creates a positive shin angle to move in either direction and allows an athlete to be in a more efficient position when beginning. The athlete's body weight should be on the inside balls of the feet with the toes pointing inwards slightly or straight ahead, they should not be turned out. Try this stance out and move side to side. You should feel much stronger when moving in either direction compared to the traditional "knees straight- ahead" stance. Strength coach Jeff Oliver is a huge proponent of this type of positioning and performs a variety of drills to emphasize these shin angles.

Positive Shin Angles ***Negative Shin Angles***

LAMT is broken down into pure lateral movements and linear-lateral movements. Pure lateral movement drills are only side to side movements. Linear-lateral movements combine both lateral and linear movements with a change of direction. The basic premise of having a positive shin angle at all times is the key teaching point.

There are 2 basic drills that form the basis of LAMT and are progressed over time.

Lateral Drill: 1-2 Cut Progression

I learned this progression from strength coach Mike Boyle; it is a simple way to teach lateral movement. Begin in the basic position, with knees in. In this example we will be moving to the right first. Initiate the movement with your right leg by picking it up and pushing with your left leg to move that direction, then repeat again with your right and left and stick your landing on your right leg and your left leg in the air. When sticking, the athletes weight should be distributed on the inside ball of the foot, and the knee and shin should be pointing towards the left (direction you want to go). Now begin with the left and push with the right, leaving you back on your left leg. It is important to be able to decelerate with the knee in. You will notice that if the athletes' knee comes out and the shin angle is lost, the athlete will fall off balance. This drill then progresses to where there is no stick and there is a fast change of direction after two steps. This drill can also be performed with three or more steps. The drill is then progressed to where the athlete performing the drill is resisted by a band held by the coach or partner. Eventually, one can try it moving forward and backward at 45-degree angles.

Linear-Lateral Drill: Clock Progression

This is a progression that strength coach Shawn Windle and I created to teach linear- lateral movement. The drill is based upon the numbers of a clock, and begins with a 5-10 yd. sprint to a cone, where the athlete changes direction towards a number on a clock. The key to teach the movement is to point the knee and shin towards the direction they want to go. For example, if I wanted run at 1 o'clock, I would have to push off of my left leg, and would need to point that knee and shin in the direction I wanted to go (1 o'clock). The drill should be performed both ways (i.e. 1 and 11 o'clock for right and left changes of direction, respectively). It can also be performed backward to forward, lateral to forward, forward to lateral or any other combination you can think of. The key is to always look for the shin angle and drill it to the athlete to have a positive shin angle. The drill begins by changing direction towards 1/11 o'clock, then to 2/10, then to 3/9, then to 4/8, and finally to 5/7. The angle at which the change of direction must occur becomes progressively smaller, which makes the drill much harder to perform because a greater amount of high speed eccentric strength is needed to decelerate and then re-accelerate.

These are all examples of programmed changes of directions where the athlete knows where to go. As the sport season approaches more random change of direction drills are necessary. A variety of drills emphasizing a change of direction to a visual, auditory or tactile stimulus should be implemented.

1 'o' Clock Shin Angle

11 'o' Clock Shin Angle

Summary

I hope that I shed some light on some different methods in training movements and making athletes more efficient. I have found these methods very "teachable" and effective in athletes of different ages and

experience levels. Don't get carried away with making everything sport-specific; rather, teach athletes how to move and be more efficient. This will yield superior results in terms of increasing their overall athleticism while making it easier for them to quickly pick up sport skills.

Remember that the key point in teaching athletes new motor skills is to demand perfection with technique. If athletes are performing movements like garbage, they'll get garbage results. Coaches should practice these drills before having their athletes perform them. Always make sure that you can do it yourself before you are going to have somebody else do it. By performing the different drills, you will notice what to feel and how it should look; doing so will make you a better coach. So get off your butt, and get moving!

I would like to thank Ari Confesor for being such a great model in the pictures above.

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