SUMMER OF SPEED

TeamBuildr eBook

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SUMMER OF SPEED: TEAMBUILDR'S GUIDE TO SPEED AND CONDITIONING

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1. INTRODUCTION

By David Kitcen

With summer quickly approaching, sport performance coaches across the country are turning their attention to designing and implementing effective speed and conditioning programs. For some coaches, this can be a stressful time for multiple reasons. Although we all (should) have the prerequisite knowledge and education to design and implement safe and effective speed or conditioning programs, there is no doubt this area of programming seems to cause the most debate in sports performance. In my opinion, the reasons can all be traced back to an overarching problem in sport performance: lack of resources. Whether it's due to coaches being spread too thin, lack of space, time, staffing, or just calendar or logistical conflicts, many performance coaches are not getting the same amount of exposure to speed and conditioning work when compared to weight room time. This leads to a large imbalance in expertise and comfort in designing these programs. I've had roles where conditioning and speed training are a large part of what we do, and I've held positions where I do little to no speed or conditioning training. Let's look at a few example scenarios to set the stage.

Scenario 1: Lack of Staffing

Division 3 and high school performance coaches are usually one-man shows. This means one coach can be responsible for 20+ programs with little to no support staff. Given the nature of this scenario, the primary focus is often given to the weight room (for good reason). Conditioning or speed development sessions are typically an afterthought. I can only speak from personal experience, but I know this always poses a unique challenge to find ways to implement these critical elements into our programs. Without going too in-depth, coaches are often forced to sacrifice quality for practicality. This may mean having sport coaches run conditioning, offering general conditioning or speed sessions open to multiple sports, implementing it during weight training sessions, or in some cases, offering no training at all.

Scenario 2: Logistical or Time Conflicts

My first experience in the private sector as a performance coach was eye-opening. Coming from the college world where we had our student-athletes year-round to the private world where athletes were in for breaks, summer, or even just a week at times caused major stress when it came to how I was going to incorporate speed training and conditioning. Private sector sport performance coaches are put under the gun during winter and summer breaks to prepare their athletes for both their sport and their return to campus. This means they have to take into consideration things like conditioning tests and collegiate strength coach approaches while trying to best prepare the athlete. Often times this means looking for high return on investment (ROI) activities. Personally, I spent the majority of my time on mechanics as I made the decision these would

have the best carryover and would best protect the athlete from injury. Despite building systems to provide the athlete with the best chance for success, I still found myself conflicted between what I wanted to accomplish and what was practical in the time-frame I was allotted.

Scenario 3: Sport Coach Demands

In the collegiate realm, there are variables that are simply out of our control. This includes sport coach demands on student-athlete resources. For example, some college basketball programs require (or "encourage") athletes to attend individual skill-building shooting sessions, and play pick-up 3x a week. Combine this with their strength program, and you are talking about high workloads that never seem to end. What is the best way to implement speed training into a program without digging the hole even deeper? This leaves performance coaches searching for the most efficient approaches even when they may contradict common practice.

In addition to packed schedules, there are sport coaches who demand conditioning sessions that border on punishment. As performance coaches, we must educate and advocate for our position using the knowledge and expertise we've gained in our careers. Unfortunately, this isn't always enough. If a sport coach has a conditioning test that leaves us scratching our heads, we still must prepare the athlete to pass the test. Sometimes, this can come at the expense of optimal speed or conditioning program design. Energy systems go out the window, sport demands and work-to-rest ratios are irrelevant, and suddenly we are forced to make the safest environment possible for an otherwise useless conditioning test.

These are just a few examples of why we as sport performance coaches must educate ourselves even more intentionally when it comes to speed and conditioning. We will be challenged, we will have to adapt, and we will have to make judgment calls. This means we have to arm ourselves with the knowledge, resources, and context to best prepare our athletes. With this in mind, TeamBuildr has compiled some of our best articles on speed and conditioning to add to the toolbox, challenge your thinking, and set you up for success as summer approaches. Welcome to the Summer of Speed: TeamBuildr's Guide to Speed and Conditioning.

2. IS TEACHING SPEED DEVELOPMENT A STRENGTH COACH'S ACHILLES HEEL?

By Jeremy Evans

When it comes to getting our athletes faster and better able to change direction, I think a lot of strength and conditioning professionals are drowning in fancy drills and starving for a systematic way to teach correct movement patterns. It is very easy to watch a video or see an article that has a lot of cool-looking change of direction drills or linear speed drills and try to add them all into our program immediately, not really knowing where and when they fit into our program.

Most strength and conditioning coaches have some type of system in the weight room, some have fallen in love with the Tier System, some love the APRE approach, and some love the 5-3-1 Program. Either way, I think you would be hard-pressed to find a strength coach who doesn't use some sort of a system or program in their weight room. We like to use these systems or programs to guide our decisions, set, reps, goals, and phases of training. The interesting thing is, when it comes to programming movement on the field or court, most strength coaches have no clue of what system they use. Most have no progressions, regressions, or goals in mind for what they want their athletes to learn or accomplish from a linear, lateral, or multi-directional standpoint.

I have heard that the phrase "this is the way we have always done it" is the most dangerous phrase in our profession, yet I have seen the same coaches who use that phrase go outside, take their athletes through a good warm-up, do a bunch of cone "agility" drills and try to pretend that their athletes got "quicker". There is typically zero coaching, cueing, or context to what the drill is supposed to be teaching or ingraining in the athletes. No progressions, no regressions, just the same cone drills every week, maybe different by each day, but the same ones every week. I know this from experience--I once did the same and I have talked with many coaches who still do the same. For some reason, we are not taught much about speed and agility in school or in most of our internships.

I think this is one area that most strength coaches would call a weakness of theirs, and I think this is a weak area in our profession and something that we could change fairly easily. If we all have our favorite systems or models that we use in the weight room for how to progress, regress and teach proper lifts, we should also have a system or model for teaching linear, lateral and multi-directional movement. The first thing we need to do is simplify all the different types of movements on the field or court that a strength and conditioning professional should be able to teach their athletes.

Our job is to help athletes become stronger, more explosive, mobile in the right areas, stable in the right areas, faster, better able to change directions and move in different planes of motion, more resilient to injury, and in better condition for their sport.

We are the support staff for sport coaches, we should be making the sport coach's job easier and making him or her look like a better coach than they actually are in most cases. We should be handing over athletes to their sport coaches at the beginning of the season who are ready to play their sport at their fullest capacity. Our job is not to step on the sport coach's toes and start teaching movements that the sport coach is paid to teach. For example, I think if we taught all of our athletes how to accelerate properly, we would be doing them a great service. But if we started teaching all of our athletes how to back-pedal, some of our athletes would think we were crazy. Some would have zero transfer to their sport, and some sport coaches might get upset that we are teaching something differently than they teach it, and now they have to undo all the habits we have built.

We are not track coaches. As the strength coach, it's our duty to be knowledgeable about lateral and multi-directional movement, deceleration, and change of direction. A track coach would be more knowledgeable about linear speed and max velocity speed. We do not need to know every single detail about how to get someone faster for a 100-meter race. The majority of a 100-meter sprint is made up of absolute speed or max velocity speed and a majority of sports don't use this type of speed much of the time.

So, what do we need to know about how to teach as sports performance professionals? I think it all goes back to the K.I.S.S. Method: Keep It Simple Stupid. I think we need to know the basic techniques for the main movements that we know will affect most of the sports that we are trying to impact. So let's boil all movements that we typically see in team sports into the main techniques that we should be able to teach our athletes. We all know there is linear speed which resembles a track athlete, the type of speed that we need to run in a straight line, but there is also lateral and multi-directional speed.

3 Types of Speed

Let's think about linear speed first. For starters, there are only really two main types of linear speed: acceleration and absolute speed. Acceleration is very much used in all the team sports that we are trying to impact with our athletes, whereas absolute speed, or max velocity, is used much less. We should know a lot about acceleration, the basic mechanics, how to progress and regress, and how to ingrain the right acceleration mechanics into our athlete's motor programming. On the other hand, as we don't need to know everything about absolute speed, it doesn't hurt to know or even educate your athletes' top speed mechanics.

When it comes to lateral speed, the main movement we need to know is the lateral shuffle. The shuffle comes into play in the majority of team sports; tennis, lacrosse, basketball, baseball, football, etc. It's important to first make sure we establish the right movement patterns of the shuffle and then we can progress that movement by teaching it in a reactionary environment.

The main technique that we should be teaching our athletes to improve their multi-directional speed and change direction effectively is a movement called the cross-over. Again, K.I.S.S. we just need to know the basic mechanics behind the cross-over and how to establish those correct movement patterns with our athletes. Then we progress them from basic drills into more chaotic drills where they use the correct mechanics with a reactionary component.

So, if you really boil it down to the basics of what we should be teaching our athletes that will translate to most, if not all, sports is:

1. Acceleration drills for linear speed
2. Lateral Shuffle drills for lateral speed
3. Cross-Over drills for multi-directional speed

Of course, there is room to add one or two movements to this list that could be beneficial, but in light of this blog, we will keep it simple and focus on these.

Progressive Speed System

Now that we've gone over the three main techniques to teach, we need a system to help guide our decisions just like we do in the weight room. I learned this system very well during my three years at EXOS, and have adapted it to fit the needs of my athletes and the large groups that I work with. The beauty of this system is that it can be used in a one-on-one setting as well as a large group setting. It is what I call the Progressive Speed System and there are three tiers to it. The first level is called technical, the second is pre-programmed, and the third is random.

In the *technical phase,* the athletes are only doing drills and movements that are preparing the body to do the movement for that day. These drills are very basic in nature but are great at building context to what you will ask the athletes to do next in the second and third levels.

The *pre-programmed phase* consists of drills that actually use the focused movement of that day, but they have no reactionary component to them. In these drills or movements, the athletes know exactly where they are starting and where they are stopping, a good example would be cone-based drills. The point of this phase is to take the athletes a little further than just the technical aspects of the movement and see if the movement is still efficient, or if they fall back into bad movement patterns.

Once the athletes have shown proficiency in the technical phase and the pre-programmed phase, it is now time to move them to the *random phase* and see if the movements you have been focusing on are actually being utilized by the athletes or if they fall back into old habits. We would like to get all of our athletes into the random phase before the season starts, depending on how fast they are picking up the techniques in the technical phase and how they look in the pre-programmed phase.

This system is very powerful and very simple at the same time. It allows coaches to take their favorite drills they are already using and new drills they learn at clinics and know exactly when and where they go in their program. It makes speed development very easy to progress towards an actual goal, instead of throwing random drills at our athletes and hoping something sticks and transfers to the field or court of play.

Head to www.evanssportsperformance.com to learn more about the Progressive Speed System.

3. OH, YOU WANT FAST ATHLETES? TIME TO LEAVE THE WEIGHT ROOM

By Zach Kinninger

When I was in high school, I was fortunate enough to be able to play football and run track. My running backs coach was also the sprint coach for the track team, so I was encouraged to run in the off-season. I progressed each year and got faster which was primarily to help with football. Towards the end of my high school career, it showed as I was one of the fastest kids on the football field and in the conference.

Unfortunately, my senior year days before playoffs I took a hit to the knee and tore my PCL. When I saw the doctor he informed me how fortunate I was to have torn my PCL vs ACL. He said, most PCL tears are not repaired. Once the swelling was gone, I could start strengthening it again. I'll never forget hearing those words and how excited I was because I might be able to make a comeback for track season and have a chance to take down the 100m school record that I was chasing as a junior. Fast-forward to the end of rehab, which went as smoothly as possible. My maximal strength on squats was back up to my original max, I was vertical jumping just as high as before, and doctors cleared me to start training for track.

Obviously, for track practice, I started at a much slower progression but when it came time to let the training wheels off and sprint, I could not do it. Every time I went full speed I felt a sharp pain in my knee. It only occurred during max effort sprints. I went back to the doctor who was just as puzzled as I was and ended up getting an MRI that showed a torn meniscus.

Today, I now understand why that pain never showed up until sprinting. If you compare sprinting and strength training they are almost completely different movements. If we look at the definition of dynamic correspondence it is defined as an exercise's or training program's ability to directly affect the athlete's sporting performance. This can also be simply described as the 'transfer effect', or 'transferability' of training. Looking at what Verkhoshansky describes in his Special Strength Training Manual, for an exercise to have direct transfer to an athlete-specific movement it must meet 5 different criteria. The first 3 are focused on the actual positioning and the last 2 are on the intent of the exercise. I have listed them below:

1. Muscle Groups Involved in the Exercise
2. Amplitude (Range of Motion) and direction of Movement
3. Accentuated part of the movements Amplitude
4. Magnitude of force-effort and time of its application
5. Regime of muscular contraction

Based on Verkhoshanksy definition, if we compare the two different exercises:

Dynamic Correspondence Criteria	Sprinting	Traditional Squatting
Muscle Groups	Total Body	Total Body
Range of Motion	Positive Shin Angle (Knee Over Toe)	Vertical Shin Angle (Knee Behind Toe)
Accentuated Part of Movement	Fast & Elastic	Slow & High Tension
Magnitude of Force-Effort & Time	High Force Under Short Amount of Time	High Force Under Long Duration
Regime of Muscular Contraction	Reciprocal Inhibition	Isometric Tension

The main goal for squatting and any high force movement is to create tension. Compare that to sprinting you will find the complete opposite. Sidenote: When I mention squatting, I am referring to the traditional technique that is most often demonstrated in powerlifting. Wide stance, vertical shin, and depth below 90 degrees at the knee. The goal of sprinting is to stay relaxed and maintain fluidity, timing, and rhythm. For example, in a tug a war contest if each team has equal strengths there is no movement of the rope and a lot of force is being produced. If you think of the same situation but one team completely overpowers the other, the rope moves faster so less force is being produced compared to the first case scenario. Just like anything in sports training, there is a fine balance between everything. Your body adapts to the stresses that are placed upon it. Constantly grinding slow weights will teach your athletes tension and stability which could be a good thing. Exclusive exposure to this type of training will cause the body to adapt by making it become tense and less mobile which will decrease the efficiency of movement performed at high velocities.

In all dynamic movements, there is a reciprocal inhibition that occurs (the process of muscles on one side of a joint relaxing to accommodate contraction on the other side of that joint.) I will use hip extension as my example since that is the “go-to” in athletic performance. In sprinting, when the hip goes into extension, activation of the muscle fibers in the gluteus maximus will thus be accompanied by an inhibiting effect on the iliopsoas fibers. During strength training, this inhibition effect is reduced due to simultaneous contractions of the agonist and the antagonist (also defined as co-contractions). Due to higher tension and less elasticity, the speed of movement is decreased -- limiting the effects of reciprocal inhibition.

I’m not here to bash peoples’ perspectives and say that squatting or high force movement is bad for your athletes, but I do want to give a different perspective to the traditional way of thinking. I understand that you must have some sort of general strength to apply force in training. I am not

doubting that. For example, take a shot putter who can bench press 200 lbs, if that is increased to 300 lbs then his performance will likely increase. Take the same athlete and increase his bench from 300lbs to 400lbs. His performance will not improve as significantly as before. That is due to speed/velocity now being the limiting factor. The same is said for sprinting, strength, and max speed - they complement each other.

I think Charlie Francis proved it best with Ben Johnson who has been recorded for squatting over 600lbs. I chose him because Ben Johnson seems to be the example for most strength coaches when it comes to speed and strength training and how they correlate. What most people do not consider is that Ben Johnson was an elite sprinter who performed sprints while strength training at the same time. Ben Johnson knew how to get into the proper position for elite sprint mechanics, he knew how to stay relaxed while putting in maximum effort, and he understood the art of sprinting. Working with track and field has opened my eyes to this perspective that, yes, most field sport athletes have been running their entire lives but most are not efficient and can make drastic improvements.

Coordination also has a substantial part to play in the basic motor property for speed. For example, we have all seen that freshman come in who has never squatted or lifted before making substantial improvement in the first couple of weeks. It is not because they have become that much stronger, their coordination has improved. In my opinion, the most effective way to improve this skill is to include maximal sprinting in your year-round programming. I think too many times as strength and conditioning professionals we tend to overthink this. In our profession, we tend to look for correlations with everything. For example, if my athlete's hang clean max or squat jump improves, that does not mean they will automatically run faster. Again, if we look at the definition of dynamic correspondence both movements operate in different planes of motion and at different joint angles. They may be good indicators, but it does not guarantee improved speed. As a strength coach, I believe we should spend more time on sprint training drills because if an athlete can improve their sprinting efficiency it will have direct carry over to their sport and the same can't be said for improving their squat max weight 20 lbs.

Including form-running drills into your program is a good start, but if the athlete does not sprint at max speed then they will not be able to apply what is being taught. Much of improving maximal sprint technique is getting in proper positions, teaching timing, and applying rhythm. Therefore, I have found repetition to be the most efficient tool. Charlie Francis said it best, "in order to improve speed you must be above 90% of top sprint speed." Research has shown us that sprinting is the most demanding exercise that our body can produce that cannot be mimicked.

I understand a big limitation is always going to be space for a team setting. However, there are

plenty of coaches who have had success with improving athletes' speed just by running 10-yard dashes. So how much space do you really need? I work at a Big Ten school and still have my field sport athletes sprinting in our hallway (10-20 yards). Coaches often question sprinting with the concern of hamstring pulls. That excuse could really be said about any exercise. With squatting, what about back injuries? Most strength coaches' rebuttal would be, "that is what proper progression and coaching are for." The same could be said about sprinting, just like any weight room exercise. Only increase the volume if the technique is there. For my field sports, implement sprinting in replacement for Olympic lifting at the beginning of the athletes' workout. This ensures the athlete is fresh and is able to perform at maximal effort. A progression I like to use is a short-to-long approach which I have listed below:

Week 1: 4 x 10yds (40 yards of volume)
Week 2: 5 x 10yds (50 yards of volume)
Week 3: 6 x 10yds (60 yards of volume)
Week 4: 3 x 20yds (60 yards of volume)
Week 5: 4 x 20yds (80 yards of volume)
Week 6: 5 x 20yds (100 yards of Volume)

In summary, I am not saying that traditional ways of getting athletes stronger do not work or that you should not squat your athletes. I am saying both exercises complement each other. Athletes must develop a general base to apply and withstand forces in sprinting. However, I am saying we should include more sprint workouts into our strength programs since the goal for most coaches is to help make athletes more successful on the field. A good way to do that is to make them faster!

4. ANALYSIS: STRENGTH COACHES SHOULD CONDITION ATHLETES WITH MORE PRECISION

By Chris Neff

As strength and conditioning coaches, many of us feel comfortable with programming and implementing precisely periodized strength training for our athletes.

My goal in this article is to share and explain a simple aerobic training protocol to provide the same precision that can also be implemented effectively by any coach at any level. Coaches can teach athletes basic movement patterns in the weight room, load them and then assess athlete performance gains in that energy system. Obviously, this is more effectively done by customizing and individualizing programs. Coaches may even employ standards of strength by position. For example, football typically uses the classic breakdown of Big, Mid, Skill (Eg: Tanks, Bombers, Jets at my program Norfolk State). But even implementing sets, reps, or percentages based solely on position would not exceed the results yielded by individualized programming. Too often conditioning-based programming relies on positional standards.

In our program, for instance, one particular 270-pound defensive lineman can run all day long while another 340-pound defensive lineman does not run nearly as well. Does asking these two athletes to run 110-yard sprints or gassers at the same time requirement make sense? With that in mind, we asked ourselves: "Are certain athletes getting in better aerobic shape or are we simply making them tired?"

In our case, the rest times administered were too short for athletes to fully recover, so the number of reps, distance, or speed dropped as the session went on. Along with that, the volume was too high to improve speed and power. We concluded the conditioning performed at that time was putting the athletes into what we called the 'Mediocre Middle.'

To address this, we developed and implemented a system that requires the athletes to meet standards that are based on individual performance. The same way strength coaches program squats at 70% for 3x5, this system prescribed a similar method for conditioning.

The first step is to test an athlete's aerobic capacity. A simple six-minute run test on a track suffices to negate any speed advantage while effectively tapping into the aerobic system. Our staff actually hypes this test up like any other test performed in the weight room. Results are then posted and shared; athletes that do not perform well are made known and will be trained further until their scores improve. No one likes to see their name at the bottom of any list. Those that do perform well are rewarded consistently by performing 1-2 fewer reps during a session, or they

are given an extra recovery shake or snack.

Here is an example of what the data will look like after testing:

Name	Distance	Distance / 360 Seconds
Athlete 1	**1600 meters**	**4.44 m/s**
Athlete 2	**1585**	**4.40 m/s**
Athlete 3	**1565**	**4.35 m/s**
Athlete 4	**1550**	**4.30 m/s**
Athlete 5	**1530**	**4.25 m/s**
Athlete 6	**1490**	**4.14 m/s**
...	**...**	**...**
Athlete 90	**700**	**1.94 m/s**

Once we have the results, we divide the athletes into subgroups in order to make training a large group logistically easier by averaging the individual results into a subgroup average.
If we use athletes #1-6 from above as an example, those results would be averaged into a Group 1 average of 4.3 m/s. This process continues for the remaining athletes; 4 to 5 groups are a manageable number of subgroups.

Once subgroups are formed, specified conditioning training can then be programmed. The intensity, or percentage of an athlete's best pace, varies on the current phase of training and day of the week just like any other training modality or exercise. Groups will condition 1 or 2 days per week in the winter, 1 day per week in the spring, 2-4 days per week in the summer, and then on Sundays during in-season.

Here is an example of a 1x week training session that would be run during spring ball:
Using Group 1's average of 4.3, we would first reduce the pace to 75% (3.23 m/s) and then multiply that by the time for that session (300 seconds on week 1). This gives us ~970 meters, the distance that the group needs to cover in the allotted time - 5 minutes - which is marked on the track with numbered cones to indicate the start and stop positions. After the rest period, the group reverses direction on the track, returning to the original start position.

Here is a breakdown of re-testing from our first summer:

8 weeks. 2-3x week running
Offense: 17.3% Increase in distance. Median: 1125---1325
Defense 9.8% Increase in distance. Median: 1325---1500
Offensive Line: 22% Average increase.
10% = ~100 meters.

This style of conditioning will initially raise eyebrows, especially from the sport coaches who-may be confused when athletes aren't falling out on the floor or walking around with their tongues hanging out from fatigue. It doesn't "look" hard all the time. But the athletes tend to quickly appreciate it once they understand the thought process of it being based on their own performance - not guesswork.

Excel is imperative to staying organized with results and programming. I'm happy to share our Excel templates with anyone.

We believe this system of "Running, Ranking, Reassessing" is great for showing a progression and a systematic approach to conditioning athletes at a time when there is a dark cloud surrounding our profession when it comes to conditioning athletes.

This system makes up approximately 90% of the total yearly volume of conditioning our program performs.

I only have anecdotal evidence to support this claim, but our heat-related issues (heat cramps, exhaustion, etc.) are nonexistent even in the humid, dog days of summer in east Virginia.
Even if you do not completely modify your conditioning program to this method, I hoped to have revealed some aspects that should be considered when programming conditioning. Please do not hesitate to contact me if I can help at all and thank you for taking the time to read this article.

5. THE SINGLE BIGGEST KEY TO DEVELOPING SPEED IN YOUTH ATHLETES

By Jeremy Evans

Practicing a Speed Development System

When it comes to agility and speed training for youth athletes, I tend to see many youth coaches out there making some common mistakes. The first mistake I see is coaches doing way too much. I also see coaches constantly running athletes through cone drills and agility ladders and calling it "speed work" or "agility training." As an industry, we need to take a step back as sport performance coaches and really look at what athletes need to be coached from a linear speed standpoint and multi-directional standpoint. Once we do that, we can start by teaching the basic movements that our athletes need to effectively and efficiently move fast. This is done by choosing and improving the movements that will affect the majority of our athletes and their sports.

This is the same concept that coaches implement in the weight room. For example, we know the lower body presses and pulls, the upper body presses and pulls and we categorize these movements in order to practice a balanced approach. The same approach should be used outside the weight room when it comes to speed development. Below are the "big four" movements that I teach to my athletes. I have 2 categories: linear speed and lateral/multi-directional speed and each category has two movements for a total of 4 movement types.

- Linearspeed: Acceleration and Absolute
- Lateral/Multi-Directional: Shuffle and Speed Cross-Over

These are the four primary movements coaches should focus on for performance development; anything outside of these four movements would consider the job of the sport coach. There are many other movements that are specific to each sport that the sport coaches or position coaches should be responsible for teaching. The job of a performance coach is to build "all-around" athleticism, it is not our job to specialize.

The Need for A System

Once the "big four" are realized, then a system can be developed for speed and agility coaching. Most coaches can tell you what system they use in the weight room whether it be the tier system, APRE, or 5-3-1. However, many cannot define a framework for their youth speed training program. It's normal for coaches to be more comfortable with weight room development as education in our industry is biased towards that component (among other reasons) but performance coaches must be well-rounded in today's competitive environment - and more importantly, it is owed to the athletes that we provide competent coaching in all areas.

As a reminder, performance coaches build "all-around" athleticism, it is not our job to turn our kids into powerlifters, Olympic lifters, or bodybuilders. The weight room makes for better athletes and helps to reduce the risk of injury, but teaching movement skills is the best way to transfer physical development onto the playing surface. I believe teaching movements skills such as acceleration and change of direction is going to "bridge the gap" between the weight room and sport better than anything else. The single best way to effectively develop movement skills is through the use of a system.

Here is the system I currently used which was developed during my time with EXOS:

- Technical
- Pre-Programmed
- Random

This model accounts for the time of year my athletes are in and it also determines what a single session looks like. For example, at the very beginning of each semester, I will spend the majority of my speed sessions working on technical work for the movement we are trying to pattern that day. Also, no matter what time of year it is, each movement session will begin with technical work and "work into random" as the semester progresses. For example, at the start of a new semester, we may spend the first 20 minutes of the session working on technical drills that will prepare the body to move the way we want it to and spend 10 minutes on pre-programmed drills with no random drills at all. Towards the end of a semester, we will spend very little time working on technique and spend the majority of our time in pre-programmed drills and we will do some random drills every session. Spending all semester in technical and pre-programmed drills would not prepare our athletes for their sport where they are expected to respond to external stimuli with the correct movement pattern as quickly as possible. On the other hand, spending all semester in random drills and not teaching the fundamental movements will result in faulty movements, risk of injury, and lack of overall development.

The Warm-Up

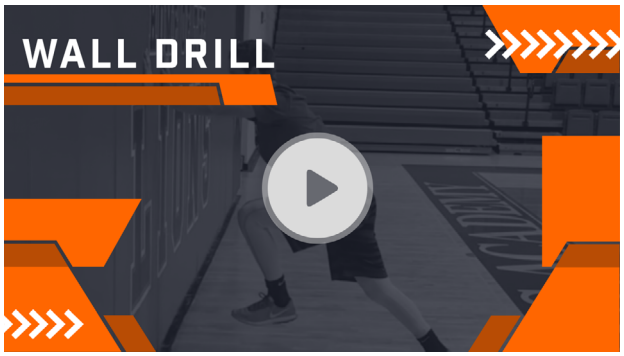
Our system varies the warm-up daily depending on the focus for the day and seamlessly blends into the movement we are trying to develop that day. The warm-up consists of four components that help get our athletes' bodies ready to work on our session's movements.

1. Glute Activation
2. Dynamic Flexibility
3. Movement Integration
4. Neural Activation

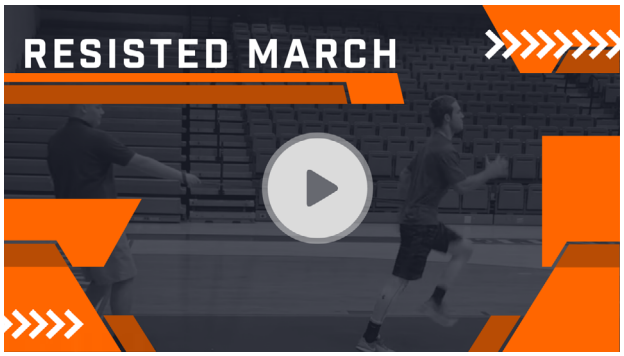
Glute activation is done in this system with mini-bands and/or glute bridges. Dynamic flexibility is where athletes go through a dynamic warm-up, "world's greatest stretch," reverse lunge with a rotation, bear crawls, etc. Movement integration is where the body prepares to go through the motor programming used in the coming speed session. This is where marching and skipping come into play. At the end of the warm-up, the athlete's central nervous system is engaged and ready to perform by doing some fast feet drill or agility ladder.

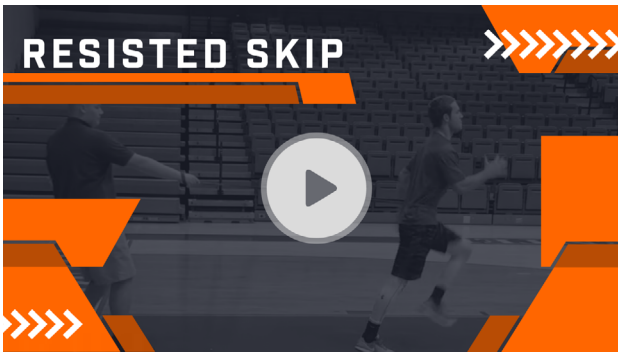
Technical

Technical work directly follows the warm-up. Again, the time spent in this phase depends on the age group and the time of year. For this example, let's choose the "acceleration" movement and break down the model used within this system. Technical work is always going to be some sort of wall drill or very low-level drill aimed at building context for the next movement. It will also let the athletes feel how they should be moving. Below is an example of an acceleration wall drill. Many coaches are familiar with this drill, but it's often used without context for their athletes and the drill turns out looking like a waste of time. This drill requires precision which means a performance coach should know how to assess and correct the athletes who are not meeting those criteria, but that is for another time. Make it a priority to let athletes understand why this drill is important and how it is going to transfer into the next drill.



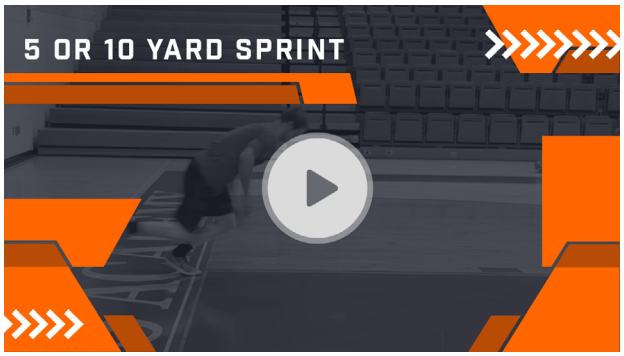
Another way to do technical work that will transfer very well to the actual movement of acceleration is bungee or band resisted marching and skipping. These drills prepare the athlete's body for the demands of the pre-programmed drills.





Pre-Programmed

Pre-programmed drills are considered the actual movement for the day but athletes are not yet reacting to an external stimulus. This means the athlete is doing the actual work of acceleration with knowing exactly when and where the drill begins and ends. In other words, athletes are not responding to a whistle or a "go" call like they would in a competitive situation. In the example of acceleration, this would be something like a five or ten-yard sprint where the athlete can start the drill on their own signal. The goal of this phase is to try to take the technical work and actually use it in a movement drill. If they can do this properly they may be ready to move on to random work. Sometimes it takes weeks or months before the athletes are ready to use the correct technique in a random drill. However, once athletes achieve this, they will likely be using the correct techniques during competition.



Random

Random drills are considered the highest level within this system and are essential for transfer to sport. Every team sport requires an athlete to react to an external stimulus very quickly while using good technique and movement strategies. The inability to do this can lead to poor performance or injury. Here is one example of a random acceleration drill, but there are many out there to choose from.

Conclusion

This is a system - or teaching model - that I use currently and used with EXOS to teach movement skills that transfer to all sports. Whether a coach decides to use this specific system, they should have some kind of system around how to teach movement. Notice that we only covered acceleration in this post but more movement types could have been used as an example.

If you're interested in learning more, I recommend engaging in a mentorship, checking out Altis, reading and watching everything by Lee Taft, or getting the online XPS certification from EXOS. Finally, I recommend doing things outside of your comfort zone in order to make yourself a better, well-rounded performance coach.

6. DESIGNING AND IMPLEMENTING AN EFFECTIVE SPRINT SESSION

By John Garrish

There are a few key points I like to keep in mind when programming the first half of a sprint session. Although this includes our dynamic warm-up, it is not limited to it. For the sake of this article, I'd like to discuss the many things you'd see at one of our sprint sessions before sprinting. I'll spare you the textbook definitions and explanations to say that the goal of this article is to help guide the athlete into a state of physical and mental preparedness for the impending sprint session.

I work predominantly with middle and high school-aged athletes so I'll preface much of what I'm about to say with this: Most of my population is more immediately "ready" to sprint on a given day, physically and mentally than a more advanced, older population. Many if not most of my students can walk on the track or field, sprint, and not pull a hamstring. The same number of them set up foot races before practice before we can even wrangle them for the warm-up. When you're in a setting with a group of kids who may not need as extensive a warm-up and who typically want to sprint, the goal becomes much less about how to excite them mentally and physically and more about how to not dull that excitement. However, there are still some important points we want to address before sprinting.

The Warm-Up

The "warm-up" is performed before sprinting for reasons much different from why technical drills and plyometrics are, but all of them are used to get the most out of the sprint session. My thought process on our sprint warm-up has changed dramatically over time. I used to think of the warm-up as a checklist of exercises to prevent a checklist of injuries. This led to the belief that if somebody was ever hurt during a sprint session it was because of something they did or failed to do in the warm-up. Although that may not always be entirely untrue, I've found it to be more likely that it was something we'd been doing too little or too much of in other parts of our programming.

Instead of putting pressure on myself to use a laundry list of dynamic stretches in the first fifteen minutes of a session, I look at the entire session as a pyramid step-by-step process where each period only needs to prepare the athlete for the next. Our dynamic movements only need to prepare the athletes for their hops, skips, gallops, or bounds for the day. Those movements will leave the athlete more than prepared for technical drills and technical drills will bleed into true sprinting. My old warm-up would have been all of those things thrown into a blender... and then we'd get hurt.

Today, our warm-up is five minutes of low amplitude movement skills like skipping and general movement patterns that do not change no matter the day or training quality. I prefer this to be routine because it's frankly the most boring part of the session for our athletes. Though it's very important, it does not merit the variation and explanation I once gave it.

Locomotive Plyometrics

Skipping is a major part of our training catalog. We perform them for height, distance, and speed as well as at lower amplitudes to practice rhythm, coordination, and raise the athlete's body temperature. As the athlete progresses through the warm-up, skip variations intensify until they are eventually performed at maximal efforts.

We use gallop variations in much the same way, generally with our second speed session of the week. These movements are performed at extremely low volumes and will eventually include bounding variations, which I've discussed in a previous blog post.

Skip Progressions and Volume Recommendations:

Day One, Week 1:
- Low Amplitude Skips Between Dynamic Mobility Movements
- Low Amplitude Skips for Height

Day One, Week 2:
- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height

Day One, Week 3:
- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 2x15 Yards

Day One, Week 4:
- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 4x15 Yards

Day One, Week 5:
- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 6x15 Yards

Day One, Week 6:
- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 2x15 Yards

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Day One, Week 1:

- Low Amplitude Skips Between Dynamic Mobility Movements
- Low Amplitude Skips for Height

Day One, Week 2:

- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height

Day One, Week 3:

- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 2x15 Yards

Day One, Week 4:

- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 4x15 Yards

Day One, Week 5:

- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 6x15 Yards

Day One, Week 6:

- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 2x15 Yards
- Medium Amplitude Skips for Distance 2x15 Yards

Day One, Week 7:

- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 2x15 Yards
- Medium Amplitude Skips for Distance 2x20 Yards
- Maximal Effort Power Skips for Distance 2x20 Yards

Day One, Week 8:

- Low Amplitude Skips Between Dynamic Mobility Movements
- Medium Amplitude Skips for Height
- Maximal Effort Power Skip for Height 2x15 Yards
- Medium Amplitude Skips for Distance 2x20 Yards
- Maximal Effort Power Skips for Distance 4x20 Yards

As an example, here is what the start of our week 8 session might look like. Keep in mind, that all of these are performed for 15 yards.

1. Simple Skips Forward
2. Simple Skips Backward
3. Walking Scoops
4. Walking Reach
5. Simple Skips Forward w. Arms Crossed
6. Simple Skips Backward w. Arms Crossed
7. Knee Hug
8. Ankle Grab
9. Simple Skips Forward w. Arm Circles
10. Simple Skips Backward w. Arm Circles
11. Quad Pull + Forward Reach
12. Walking RDL
13. Lateral Skips
14. Walking Lunge Forward
15. Walking Lunge Backward
16. Low-Level Skips for Height x2
17. Medium Level Skips for Height x2
18. Power Skips for Height x2
19. Medium Level Skips for Distance x2
20. Power Skips for Distance x4

This is simply a progression of how one might develop the motor ability and tissue tolerance to perform these drills at a high level. Candidly, most of my population does not need a very extensive warm-up, but the manner in which we prepare for the maximal effort skips serves as more

than enough to be able to perform them safely.

When we have progressed to the point that the skips are being performed adequately, the intent of the movements can be married to the intent of the overall session. For instance, I prefer power skips for distance before an acceleration-oriented session while I prefer power skips for height on an absolute speed day. There may still be skips for height on accel day in lower volumes and skips for distance before an absolute speed session, but the volumes will reflect the preference. The main reason I delay the introduction of power skips for distance by a few weeks is due to the mentioned motor skills. Power skips for distance have occasionally been the cause of quad pulls when we introduced them too quickly. Since I started introducing them a little bit later, we have had no issues.

I'll spare you the repeat presentation of how we progress into high-level galloping because it's almost exactly the same as the power skip progression. I allow the motor learning to dictate our progressions on nearly all exercises so just because something is on paper does not mean it is exactly how it will progress. For instance, galloping typically takes a little bit longer for the athletes to grasp because they're a little less familiar with it than they are skipping (typically). Even the most remedial version of these movements will benefit the athletes because of the low-amplitude varied ground contacts and coordination it takes to complete them. This is a good time to remind coaches to take their time with these progressions. This is simply a progression of how one might develop the motor ability and tissue tolerance to perform these drills at a high level. Candidly, most of my population does not need a very extensive warm-up, but the manner in which we prepare for the maximal effort skips serves as more

Technical Drills

Sprint drills have, understandably and reasonably, faced much scrutiny from both track and performance coaches. My philosophy on sprint drills is simple, we use them to provide context later on. I do not believe the drills in themselves are going to provide a stimulus for the athletes to adapt to that will make them faster. Instead, I consider this a teaching/learning-heavy period of practice that athletes must be fresh and alert for. These drills will progress from slow to fast, simple to "complex" and elevate in intensities so that once the drill series has been completed, the athletes will be ready for their sprint workout for the day.

An example of this might be dribbles, where I've had luck following a once-counterintuitive progression of using single-leg dribbles and progressing into the double leg version. The reason for this, I believe, is in order to rewire an athlete's movement patterns we should get them as far away from that pattern as feasible before progressing him/her back toward an improved version of it. What these single-leg dribbles look like is a "Working leg" moving in a pattern that looks

like it's riding a bicycle while the other looks as though it's dragging along the ground.

The purpose of this progression is to acquire a skill. So, as much as I'd love to provide a baseline amount of days or weeks each drill should be spent, I think it would be inappropriate as it's all dependent on how the athlete(s) perform them. Our dribble introduction follows this progression:

1. Walking Single-Leg Dribble
2. Jogging Single-Leg Dribble
3. Full Speed Single-Leg Dribble (High Step Frequency, Low Horizontal Velocity)
4. Jogging Dribble
5. Full Speed Dribble (High Step Frequency, Low Horizontal Velocity)
6. Slow to Fast, Low to High Dribble (Step over ankle to knee, slow to fast)
7. Slow to Fast, Low to High, High to Low (Stay Fast) Dribble

This final progression is my favorite in that I think it not only helps the athlete feel positions and movements that we want to see replicated at higher horizontal velocities, it's also a pretty safe way to introduce significant step frequencies without the large ranges of motion.

Once these drills have been concluded, I'll instruct our students to run 2 to 3 build-up sprints to be sure they're prepared not only for the frequencies of high speed sprinting but also for the ranges of motion.

Our actual "sprint" portion of the session will be extremely low volume with the reps and distances to be dependent on the training intention. For linear sprinting, our sessions are going to fall into one of three categories: acceleration, max velocity, or speed endurance. Mind you I'm a track coach, the bulk of our field sports train differently for energy system development than our track athletes do.

Again, these progressions are what I've found to be successful with my population. They evolve, adapt, and grow over time as should any good training program. With that in mind, as long as the principles are followed, find what works best for your situation.

7. 3 SLED DRILLS FOR ENHANCING SPEED AND AGILITY

By Justin Ochoa

Speed kills. Agility thrills. Together... well, I can't think of another word that rhymes, but together they are a vital combo for almost any athlete out there. Being stronger and faster is never a bad idea. Recently, I heard Mike Boyle speak at the NHSSCA National Conference. He nailed it when he said, "If you want to be stronger, lift heavier. If you want to be faster, run faster."

The beauty of that simplicity is awesome and so true. If you still need something to fill the cracks, there are some great exercises for speed and agility out there. I've taken a strong liking to sled training for speed for filling these cracks. It's heavy. It's fast. It's fun. It works. Before we get into these three go-to sled drills, let's look at a bird's eye view of speed, and agility and break down how these drills can help.

Speed & Agility For Dummies?
What is speed? The rate at which an individual can run in one direction. Speed is stride length times stride frequency, mixed with power—which is (force x distance) / time.

Speed = stride length x stride frequency + ((force x distance)/time)

How fast can you apply force into the ground to propel yourself forward? How much force can you apply to the ground? How far can your stride take you and how fast can your strides occur? Sure, it's deeper than that but, in a nutshell, this is what makes speed. Trying to get to the meat and potatoes here, not bore you with science that you already know!

What is agility? Agility is an athlete's ability to change direction at a rapid pace. Part of this process is physical via actions like deceleration and re-acceleration. The other part of changing direction is non-physical reaction, meaning you must assess a situation while you're traveling one way and make a conscious decision to stop your momentum and redirect it into a completely different direction.

A lot of "speed and agility" drills we see these days do nothing to truly enhance these definitions above. Choreographed drills that look like clips from "Dancing with the Stars" mixed with really bad tap dancing don't allow athletes to apply or absorb much force at all, and surely don't challenge brain reactivity.

Other drills that look more appropriate may be getting turned into sloppy conditioning drills by

not implementing proper rest and recovery periods after the explosive bouts. Remember, speed and agility relies heavily on the different application of forces and anaerobic energy. If you're gassed, you can't cash in on that. Turning plyos and SAQ work into cardio is something to be really careful of.

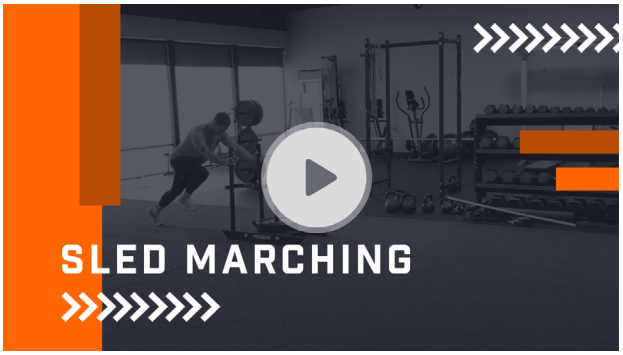
The reason I turn to the sled workout for speed so much is that it allows athletes to produce force quickly against a pretty moderate load. Again, this fills the cracks in the simple approach of Boyle's "run faster to get faster" mindset.

Programming methods and drill creativity can handle the mental aspect of SAQ while the sled allows the athlete to dig in and create some true progress. Here are 3 exercises for speed and agility that have worked really well for us.

Sled Marching

Every coach has seen the Wall Drill or Wall Acceleration Drill that went so wrong so fast. A drill that is supposed to teach body angles and force production during acceleration quickly turns into a crappy postured cardio nightmare. I love the idea of the Wall Drill, though. So transferring that into a sled exercise produced really awesome results.

To set up for a sled march, choose a light to moderate weight for the athlete. Position them in a forward lean stance supported by the sled, close to how the wall drill is typically executed. The athlete now marches with sprint mechanics in the lower body, making each footstrike combined with a forward lean propel the sled forward.

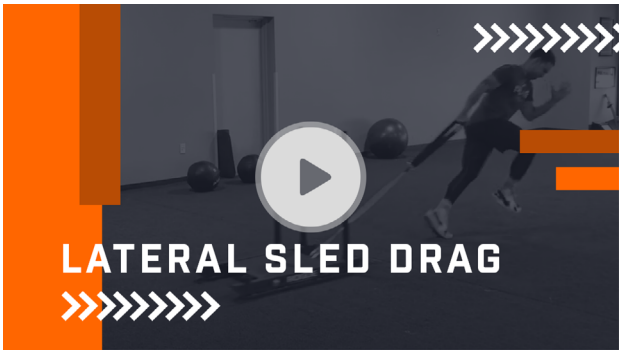


It's important that the force production down and away is what moves the sled, not the athlete's arms. Each step should land just under the hip, which is another advantage of this drill to the wall drill because it's a little more applicable to real running. Definitely exaggerate the movements here to get as much rhythm, force, and steps as possible. This has been a really helpful tool to teach forward body lean and foot placement, and to improve acceleration speeds in athletes from youth to professional levels.

Sled Crossover Drag

This speed sled workout is great for getting lateral movement and can be trained fast and light or heavy and slow. Both ways will do wonders for the change of direction strength. Athletes compete in all three planes of motion so it's always a good idea to incorporate those planes into training as well.

Set up any kind of strap or extension handle to a sled and position the athlete leaning in the direction they want to travel. The athlete should be facing to the side rather than straight ahead. The hand closest to the sled will have the handle. Moving at a slight angle away from the sled, plant, and go step-by-step executing a lateral run while dragging the sled.



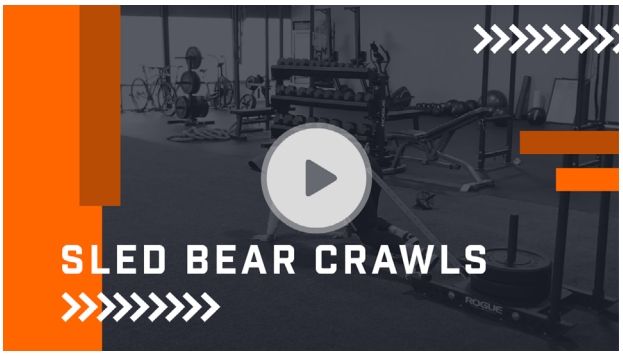
This exercise can be manipulated to achieve whatever result you're after. In this video, my feet are angled in the direction of movement, but you can also instruct athletes to keep their torso and toes facing outward. This requires more hip ER, IR, adduction, and abduction on each leg—and also works better with the heavier load and lower rates of movement.

Simple answer: Do both. Put lateral force into the ground. Get athletes used to the movement and getting in and out of cuts during competition will start to look really crisp.

Sled Bear Crawl

Since we looked at lateral and linear running motions, I wanted to throw in something that is the foundation for both of them—core work. As an athlete, having control of your center of mass is a huge factor in speed, agility, and injury prevention. Athletes move in multiple directions and must be able to control their motions and redirect them when needed. Lacking core strength and/or stability will directly inhibit an athlete's ability to do those things.

The Bear Crawl is one of the best bang-for-your-buck exercises I can think of. It has all the qualities you look for in a low-risk, high-reward movement. By adding a small amount of load behind your body, you can take the Bear Crawl to a new level of effectiveness.



By nature these are an “anti” exercise—you must resist excessive levels of spinal flexion and lateral flexion and extension. By training your torso to perform in this manner, you’re setting athletes up for a direct carry-over to controlled movements during changes of direction.

We coach our athletes to do three things before every rep: reset (check to make sure you’re in a good position), reach (push your sternum away from the ground) and breathe (nasal inhale into the diaphragm). Take it slow and steady. Crush each rep. Notice the core strength and stability skyrocket.

Hopefully, these are helpful tools for your athletes and help fill the cracks of the much simpler run fast, lift heavy approach. Together these niche speed agility drills with big rock movements can really make a huge impact on athletic performance.

8. 7 SIMPLE FIXES TO GET THE MOST OUT OF BOUNDING

By John Garrish

As track and field continues to carry its influence in the strength and conditioning profession and into coaches' programming, bounding has become a staple for many. Although bounding is certainly not a skill exclusive to the sport of track and field, I feel as though some of the best information regarding why, how, and when to bound has come from sprints and horizontal jumps' coaches, most notably Boo Schexneyder.

My own personal experience in coaching triple jumpers has helped me become a better performance coach, especially with some of the gross motor skills like skips, gallops, and bounds. With this, I have also found that there are a few very specific flaws coaches make when introducing bounds to team sport athletes.

Coach Mistakes

#1. No Teaching Progression

Some athletes can make bounding look effortless and natural. Most, however, do not and it takes them some time to master. Unfortunately, some of the common flaws of bounding for beginners can lead to lower limb discomfort or soft tissue injury. It's necessary to introduce beginners to rudimentary hops and skips before even introducing a slow bounding progression.

#2. Too Much Volume

Where I've found myself getting into hazardous territory with bounding volume is coincidentally when working through these learning progressions. I would often have a tendency to revisit previous progressions and work through each whenever we'd bound and, as a result, the volume would skyrocket. Volume should be very low, especially for beginners and those who have not completely mastered the technique of bounding. For my high schoolers that are not triple jumpers, I consider 4 reps of 15-20 yards sufficient.

#3. Failure to Classify Intent

Bounding, like skipping, hopping, jumping and galloping can have hundreds of different variations and, more importantly, different intentions driving them. A bound is a jump from one leg to another and does not in and of itself suggest an intent. Bounds can be done in place, for height, for distance, for speed, etc. The two most common mistakes I've seen used are bounds for distance and bounds for speed. Although one can absolutely use a hybrid of the two, they are not to be confused. Speed bounds more closely resemble acceleration mechanics and postures while bounds for distance, though they do not necessarily suggest max velocity mechanics, they do

seem to be an indicator of top speed ability.

"The athletes who seem to perform the best in bounds for distance are some of our top "longer" sprinters, while the athletes who perform well in speed bounds have been some of our better accelerators."

Athlete Mistakes:
The first and largest flaw that I see our student-athletes struggle with when attempting to bound is that they lack the rhythm and patience that is necessary to perform the skill well. The athletes present something that looks more like an extended stride run than a true bound. As you'd expect, this is absolutely a cause for concern regarding soft tissue hamstring and hip flexor injuries. In addition to just misunderstanding the intent of the drill, there are a few primary concepts the athletes might struggle to grasp early on.

#4. Lack of Patience
I'll be honest, this is where some of the triple jump experience is good to fall back on. "They measure the triple jump in distance, not in time" is something my athletes have heard thousands of times. Although I think patience is a holistic idea for bounding, there are three areas in which a cue or drill might help the athlete feel the patience we want them to feel. Ultimately, it's something they need to feel and not something they can simply hear. The three "points of patience."

#5. Ground Contact
Our athletes grow so used to sprinting and minimizing their time spent on the ground that sometimes they believe the objective of every drill is to do so. They've heard my cue "abuse the ground" numerous times in sprint training, now when bounding for distance they'll hear me say "use the ground". I've stolen cues from numerous coaches, so I apologize for being unable to immediately pinpoint who it was from first. The athletes should use the ground and use their time on it to create great distance between each bound instead of rushing their ground contacts and forcing rigidity. Bounding for distance should feel fluid, relaxed, and borderline passive.

#6. Head Position
Forcing rigidity or expecting to maintain upper body postures that you'd see when upright sprinting is unreasonable and faulty when bounding. I'd argue many athletes force rigidity when sprinting too, so bounding is the perfect practice of the cycle of tension and relaxation. Rotation is incredible when bounding and lateral flexion is equally necessary. I coach our kids to get their head over their foot and allow their entire body to pass over their foot through a rolling contact (to be discussed shortly).

#7. Flight

"Let the ground come to you" is something our kids will hear me say regarding flight and their impending ground contact. Another statement they'll hear is "a lot of time in the air, a lot of time on the ground" to stress patience and body position in flight. Almost all of our cues in bounding are directly counter to the cues I'd give in sprinting, so it's understandable it wouldn't immediately resonate with our students. When sprinting, I stress an active strike downward toward the ground when in bounding the violent force application will come later in the ground contact while the immediate ground contact is much more passive.

Another counterintuitive idea for the students is that bounding for distance requires more hindfoot contact vs. more forefoot contact of sprinting. Honestly, I've seen just about every other flaw corrected in our students' bounding mechanics when they've gained comfort contacting the ground with a full-foot, rolling contact. Additionally, the athletes who do this better experience significantly less lower limb discomfort. The bulk of shin pain is experienced by athletes who attempt to bound for distance with a forefoot contact.

When athletes perform bounds with exemplary technique at low volumes, we have seen tremendous improvements in sprinting and jumping ability and I would argue that combined with our RSI data suggests improvements in change of direction ability as well. Take your time, know your intent, and coach the details.

9. THE CASE FOR IMPLEMENTING CURVED SPRINTING INTO YOUR PROGRAM

By Frank Barone

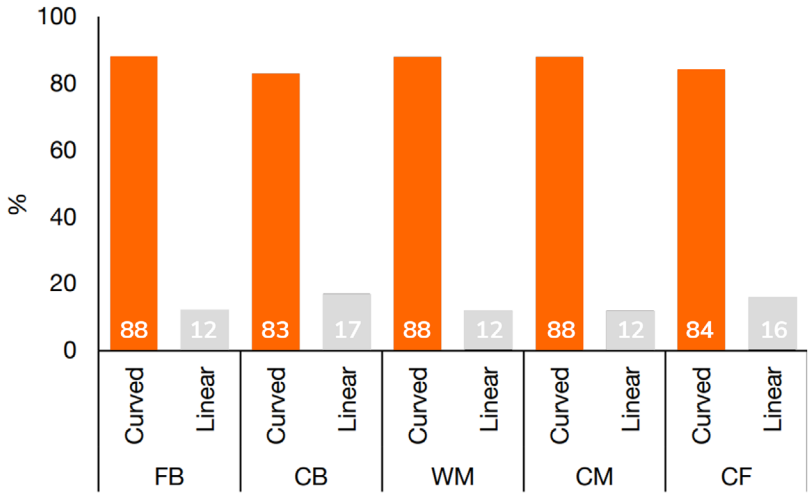
At this point, there should be no question that sprinting should be a main driver of programming for field sports. Sprinting is a major determinant of success in sports such as American football, soccer, lacrosse, field hockey, and many more. We can look at examples from many sports to show us that important moments in the game require athletes to run at top speeds. For example, a study measuring 360 goals from a top league in German soccer showed that the goal scorer performed a "linear sprint" preceding ~61% of goals, and the assisting player performed a "linear sprint" preceding ~67% of assists. It is important to note that in this study, "Slightly curved runs without a second acceleration phase were not assessed as change-in-direction sprints but instead as linear sprints." (Faude et al, 2012)

Currently, many coaches divide their on-field training into linear speed and change of direction. 10m, 20m, 40m, and flying 10's are regularly tracked to assess linear speed. Also, "change of direction" is tracked with tests such as 5-10-5, Illinois agility test, and many others. While these two qualities are important to assess and train, there is an important space in the middle of these two that is often missed.

This quality is curved sprinting.

Curved sprinting is defined as **a sprint with a gradual and continuous change of direction** (Filter et al, 2013). In other words, as stated in the earlier study, this is different than a linear sprint, or a change of direction sprint, defined as a very high-intensity run with two distinct and identifiable accelerations in different directions (more than 50° from the initial sprint-line). We can differentiate sprints in any way we want, but why is it even important to do so? Are curved sprints really that different from straight-line sprints?

Well, one study has shown, that curvilinear sprints and linear sprints are different and independent actions and must be tested and treated as such (Filter et al, 2019). Furthermore, Paul Caldbeck has done great work in identifying the different types of sprinting present in soccer matches. He has shown that **curved sprinting consists of 86% of maximum velocity running in soccer compared to just 14% linear.** While this is an example in only one sport, it is an overwhelming majority and should be taken very seriously. Looking at another sport, football, we can all remember examples of a DE with a curved path eluding a tackle, or an RB/QB trying to get to the edge on a toss or option. At the end of the day, stopping the classification at just "sprinting" or "change of direction" leaves out a major determinant of performance.



Paul Caldbeck shows the relationship of curved vs linear sprinting in professional soccer broken up by position.

Outside of just the sheer number of sprints that are curvilinear in sport, we can also look at the demands that a curved sprint requires vs a linear sprint. In a study using three-dimensional video analysis, many differences in velocity, step frequency, step length, hip adduction on the inside leg, and hip abduction on the outside leg compared to linear sprinting were observed (Churchill et al, 2015). When comparing the inside leg to the outside leg, the study also observed significant differences in ground contact time, touchdown distance, hip flexion/extension angles, and hip adduction/abduction angles.

Another study measured the strength of invertor and evertor muscle groups of athletes running on a non-banked, curved track during the pre-season and post-season periods. This study noted statistically significant asymmetrical changes in strength of these muscle groups (Beukeboom, 2000). This is but another example showing the altered biomechanics of curved sprinting's effects on the musculature.

Considerations for Training

1. "Learn the rules before you break them"

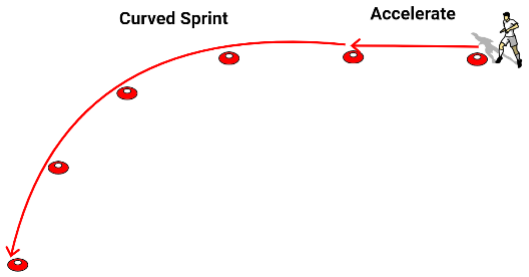
Now that we have established the differences between linear sprinting and curved sprinting, we can now take a look at training this quality. The first consideration for training curved sprinting is to make sure the athletes know the "rules of sprinting". While curved sprinting is a separate skill from linear sprinting, there are actually several key positions and movements that should be attained in both skills.

In the Dynamical Systems Theory, these are called "attractors", and they can be defined as a sta-

ble state of organization. Within each attractor region, system dynamics are ordered and stable. This leads to consistent movement patterns for specific tasks. In sprinting, these attractors are often debated, but some examples are a neutral pelvis, hip lock, and swing leg retraction. Whatever attractors you choose in your model, it is important that your athletes can attain these states consistently before adding a "fluctuation" like a curve or a torso rotation.

The next thing to consider for curved sprinting is the difference between accelerating on a curve vs. sprinting on a curve. This is where the entry speed coming into the curve is important. When accelerating on a curve, you will have a slow entry speed, or be starting on the curve itself. This requires a lower torso angle as you accelerate. In this variation, you are coaching the athlete to increase speed as they go through the curve. The opposite of this would be sprinting on a curve, where you would enter the curve with a higher speed, and maintain as much of that speed as possible throughout the curve.

There is not a better or worse option here, but be sure you know which one you are using and why. As we know, running on a curve reduces speed, so both accelerating on a curve and sprinting on a curve could be used to reduce the physical cost compared to a linear acceleration/sprint. Be careful with this though, because while the speeds are slower, the biomechanics are altered and could have a different cost.

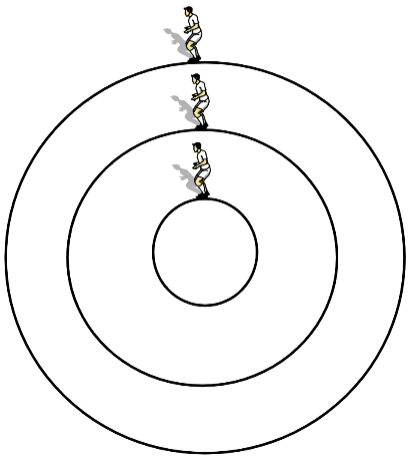


Example of sprinting on a curve. In this variation, you accelerate on a straight line and then maintain that speed through the curve.

3. Curve Radius

The last thing we will consider in this article is the radius of the curve. Not surprisingly, one study showed that as the curve radius shortened, maximal velocities went down (Chang, 2007). In other words, the closer the curve to linear, the faster the speeds that can be attained. This same study also observed that ground reaction forces reduced in the inside leg as radii shortened. This was most likely due to the eversion required at the ankle. This information can be used two-fold. First, we need to be aware of the curve radius's implications on the ankle. Running a curve at a

small radius requires a more aggressive lean in order to maintain balance around the curve. This results in more eversion at the ankle. This should be progressed accordingly. Secondly, because higher speeds can be attained at longer radii, if you are instructing your athletes to run at maximal velocities, know that you can modify the speed simply by shortening the radius.



Visual Representation of curve radius and how it will affect speeds. Shorter radius (inside circle) will require deeper leans and therefore llicit slower speeds.

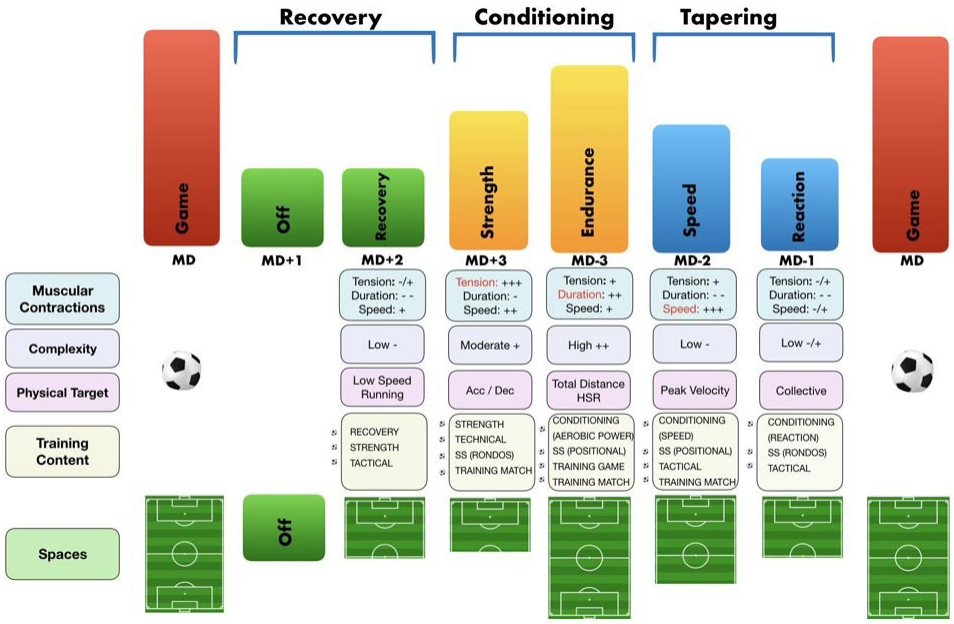
Applying Curved Sprinting into Your Program

Now that we have a better understanding of how different modes of curved sprinting affect the body, it is time to put them into practice. There are a multitude of ways to apply curved sprinting, but all have different goals, costs, and results. This section will show some ways of applying this training and when it would be most appropriate to introduce these methods into an athlete's training.

We already established that lower speeds and peak reaction forces happen at sharper curves, so we can use this to determine how we apply and progress this work. These accelerations should be progressed from lower speeds to higher speeds, and from large radii to short radii. While this is a progression, we can also use combinations of these to elicit specific adaptations.

	Large Radii	Short Radii
Low Intensity	- Medium Velocities - High similarity to straight line sprinting - Low cost at foot/ankle complex - High Technical emphasis	- Low Velocities - Low similarity to straight line sprinting - Medium cost at foot/ankle complex - High Technical emphasis
High Intensity	- High Velocities - High similarity to straight line sprinting - Low cost at foot/ankle complex - High cost to sprinting musculature	- Medium/High Velocities - Low similarity to straight line sprinting - High cost at foot/ankle complex - Medium/High cost to sprinting musculature

Using the table above, we can take a look at the 4 combinations of these two variables and interject this type of training where it fits in a macro, meso, or microcycle. For example, a high-intensity, large radii sprint could be used to elicit high-speed running. Using the tactical periodization model, we can plug each of these variations into a weekly micro-cycle to best match the desired demands.



Via Complementary training.net

GD+2 - Recovery Emphasis

On a game day +2, with the goal of the session still being recovery, this would be the best time to add large radii/low intensity curved running. This is due to the physical cost being low on both the musculature as well as the foot and ankle complex. Keeping the speeds <60%, and the curve wide allows you to work on technique of curved running while still keeping recovery the priority.

With the S-Curve sprint, you can keep the velocities low and work on the technical aspects of sprinting on a curve. This fits very well into recovery-based days.

GD+3/-4- Strength Emphasis

On GD-4, the goal of the session physically is to elicit more accelerations and decelerations and to do so with higher density. This makes high-intensity/short radii the best selection for this day. With the high physical cost already being applied to the foot and ankle with the smaller spaces, it makes the most sense to apply this method to overload these qualities.

GD-3- Volume Emphasis

Due to the large spaces, and therefore large volumes of high-speed distances that are elicited through practice on these days, isolated sprint training is rarely applied here. If it were to be applied, I would choose between low intensity/large radii, and low intensity/short radii to give a stimulus, but not overload the musculature used in sprinting as the volume tends to be enough from practice.

GD-2- Speed Emphasis

The best method to apply here is undoubtedly high-intensity/large radii curved sprinting. This is because we are looking to prepare the body to reach very high speeds during this session. The large radii allow for athletes to reach near-maximal velocities compared to linear sprints, but make the sprint significantly more contextual to their sport (in soccer for example). One thing to note here is if maximal velocity and high levels of high-speed distance have already been achieved throughout the week, this could be a space for high intensity/small radii sprints to still prepare the body to sprint in training, but to reduce the speeds that the sprint musculature is exposed to during the large radii training.

Large radii sprints as well as sprints where you accelerate before the curve will be great ways to elicit high speeds while on curves.

Conclusion

Curved sprinting is undoubtedly an important piece of training that we should all take into account for field-based team sports. There are many different modes and methods that we can apply to get the desired results, and this is where it is up to the coach to determine what is right for his or her team.

At the end of the day, this will likely be a new stimulus to your athletes. Be conservative in its introduction, but not afraid. This is a skill that they likely have been performing for years. Just like any other skill, our job as coaches is to take it from where it is currently to a higher level.

10. MY PLAYERS FAILED THE CONDITIONING TEST: WHAT'S NEXT?

By Veronica Tearney

Whether it's a timed mile run, a beep test, shuttle sprints, or some other form of fitness testing, if an athlete fails to pass a required strength and conditioning test it can set off a cascade of negative emotions ranging from frustration and disappointment to guilt and anxiety. As the strength coach, you are often caught in the middle of those emotions experienced by the team coach and the athletes.

Many times, team coaches also attach consequences of not passing fitness testing like reduced practice time or playing time, equipment or gear restrictions, loss of locker room access or other team privileges. Every coach, team, and scenario is different, so as the strength coach you may have to negotiate each instance differently, but hopefully these perspectives outlined below will give you some added insight to help navigate these often tense situations.

Coach Expectations

Having a clear understanding of not only the testing standards but what type of fitness the coach is trying to assess and what the consequences will be, are important things to establish, and as early as possible. Some specific tests are standard in a sport across all levels however, oftentimes tests are selected at the discretion of the coach and don't necessarily sync up with the qualities necessary for their sport. It's your job as the strength coach not to judge, but to guide coaches in selecting testing protocols that measure the types of skills, fitness, or energy system proficiency relative to their sports. Having this information helps the strength coach formulate a conditioning program that not only gets the athletes in better shape, but in the right kind of shape for their sport, and if the testing protocol is appropriate, the conditioning program will also prepare them sufficiently to pass the required fitness test.

All staff members should also be clear on what the consequences of a failed strength and conditioning test will be and what the timeline will look like for an athlete that does not pass. If the consequence involves not being allowed to practice or play in games, this then really becomes an urgent situation and so the answer to these questions should be considered prior to any testing taking place. How soon will the re-test occur? Will sitting out of practice cause more harm than good? What if the star player fails? What if 50% of the team fails? Will extra conditioning help or hinder re-testing? What if an athlete keeps failing after multiple attempts? Will there be a modified test option? The re-test protocol or timeline should also be established in advance. Some tests physically exhaust the body and energy systems more than others, so while a 40-yd dash could potentially be tested every day, a multi-mile gauntlet run test should probably not be.

How often a re-test opportunity will take place and whether extra conditioning will be added to the training schedule are things that should be established well before and made clear among all staff as well as the athletes on the team.

"Punishment workouts" for failed tests, tardiness, missed sessions, and other slip-ups or mistakes used to be commonplace and even expected. As times have changed, the type of punishments given or even the use of the word punishment has changed considerably. The argument for or against punishment activities is better suited for another time. Right now I want to offer a few points on workout sessions that are administered as a consequence of a failed test or failure regarding some other team policy for that matter. The punishment should fit the crime. If endurance is an issue, adding a 2, 3, or even 5-mile run (depending on the sport) or the same distances but broken up into intervals with targeted run/rest times might be more appropriate for other sports. In a test involving shorter sprints with turns or quick direction changes simply repeating the test with added reps and shorter recovery times is an option. Similarly, lengthening shuttle distances for increased endurance or decreasing distances for shorter shuttles to emphasize quicker turns or direction changes are also good approaches. If the goal of the punishment is simply to build toughness, accountability, or an improved foundation of fitness then the options are almost limitless. For example, a circuit of minimal rest involving things like stair sprints, tire flips, box hops, battle ropes, and challenging bodyweight exercises not only builds physical toughness but mental toughness as well. When selecting a punishment I also take into consideration things like whether it will involve the whole team or just the guilty parties, how close we are to competition day or the next re-test day, and when or what the next team practice is. Regardless of the reasons leading to the punishment, the workouts administered in consequence to that should be designed to elicit fitness or performance-related benefits rather than just inflicting pain, fear, or humiliation.

Athlete Expectations

Student-athletes should also have a clear understanding of testing standards, related strength & conditioning workouts, and the consequences of not passing a team fitness test. Athletes should know what the test is measuring, how it's conducted, how it relates to their sport or position, and recognize the correlation between the test, their sport, and the strength & conditioning program. Knowing these connections can help athletes mentally wrap their minds around the purpose of their training, especially when it doesn't appear obvious. This can also help reduce testing anxiety in some players and increase overall program adherence. Understanding how to do the test and the consequences of not passing the conditioning test eliminates surprises, builds accountability, and may also increase motivation because no one wants to let their team down, miss playing opportunities, or have to do extra conditioning sessions.

Strength Coach Expectations

Once everyone is on the same page with the logistics, it's now time to figure out what went wrong. Usually it's one of three things: mental failure, physical failure, or preparation failure. Mental failure occurs when the athlete is in shape and has successfully passed the test during training sessions but nerves or anxiety overwhelms them during the actual test and they fail. Usually, these athletes just need one or two more attempts to pass because the anxiety or fear decreases once they experience the test in real-time. The strength coach can help with positive talk, reassuring the athlete that they've already done all the hard work to pass this test, and help keep them calm with breathing or visualization techniques.

Physical failure occurs when the athlete is simply not in physical condition for the test. An athlete that didn't follow the S&C program, is sick, or is injured or recovering from an injury and is just not physically in shape enough to complete the test to the standard set. The strength coach can help by having an honest conversation with the athlete about why they came in out-of-shape and if necessary, work with sports medicine to create a rehab program that helps to fast track their conditioning level while working around any injury restrictions. If the athlete simply didn't do the required training, then extra conditioning sessions combined with appropriate recovery, and re-testing as often as safely possible will help jumpstart their fitness level.

Preparation failure occurs when the athlete is in shape but is either not familiar enough with the testing protocol or doesn't have the right level of anaerobic or aerobic conditioning for their test/sport. In either case, whether familiarity or specificity is the issue, simply repeating the test one or more times will be all that is necessary for the athlete to learn and adapt to the test. Remember, the athlete in this scenario is usually in very good shape, but may have geared their training towards things that are easier for them, more suited to their natural ability, or just more enjoyable to them. For example, an athlete who needed to pass a repeat shuttle sprint test, because of their avid enjoyment of long-distance running, may have conditioned themselves to be more aerobic than required by their sport or testing protocol. So, even though they are fit they just might not be physically peaked for the test-specific anaerobic sprint work. The strength coach can help simply by reassuring the athlete that they are fit and capable of passing the test, that they understand the protocols of the test, and help them with timing, change of direction, turning techniques, and other skills that could improve their efficiency in performing the test.

No one likes to fail or feel unprepared. As long as the team coach, strength coach, and student-athlete are on the same page and have open communication regarding expectations and consequences then conditioning test failure can be addressed, handled, and successfully overcome with little or no drama. As the strength coach, you have to be ready to be the mediator and voice of calm and reason during these times, especially when the season is approaching and passing a test can mean the difference between a player sitting on the sidelines or playing in a game.

11. CONCLUSION

By David Kitchen

Despite all the variables that go into speed and conditioning training, the foundational truths our profession is built upon still apply. Here are few highlights from the e-book that can serve as a reminder as you lay out the plan for your summer.

Build systems
It's been said and said again, but creating systems you know work will save you a lot of headaches down the road. Build the plan, work the plan.

Keep the main thing the main thing
Whether it's top-end speed, change of direction mechanics, or energy system development, have a goal for your sessions and stick to it. Don't be swayed into blurring the line.

Details Matter
All our authors stressed the same point in one way or another: quality over quantity. Keep your programming simple, and execute the basics savagely well.

Carryover is King
Analyze your sport demands, reverse engineer the process, and work those basic traits until they show up on the field. Cone drills and "fast feet" get likes and views, but carryover wins long term. If it's not making them better at their sport, scrap it.

Plan for the Plan to Change
Flexibility and accounting for outside variables will keep you on track for success. Manage your expectations and make sure your student-athletes are enjoying the process.

Strength Punishes, Speed Kills.

Good Luck,

The Teambuildr Staff