

Speed and Skill Optimization - A Proposal for a New Practice Paradigm

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Introduction

It is often said that the best coaches of any sport know precisely when to push their athletes and when to take their foot off the throttle. Exceptions aside, high-level coaches do not simply grind their athletes into the ground each and every practice session, creating a practice culture that overemphasizes sacrifice and grunt labor to the detriment of skill acquisition and the enhancement of speed. Due to the influence of Hollywood movies featuring caricatures of nearly-sadistic football coaches, or the annual idle chat among aging alumni under Friday night lights remembering when “coach ran them till’ they bled or puked,” the vast majority of the public have formed the opinion that hard work, and hard work alone, is the key to sporting success. If the kids do not win, they simply didn’t work hard enough. They’re too soft. They’re too coddled. They’re not committed to doing what it takes to win.

Nothing could be further from the truth.

In reality, high-level sport coaching is a delicate balance of art and science. The human body has finite parameters within which coaches and trainers must work. It only responds and adapts to certain forms and quantities of stress which must be carefully prescribed, monitored, and periodically reassessed. A coach who simply seeks to make his athletes exhausted during each and every practice is a coach lacking all understanding of human physiology and of the nature of sport itself. For sport is not merely a matter of strategy and tactical decision making, but also a matter of skill acquisition and performance. In our experience, many coaches generally understand the former, but almost entirely lack knowledge of the latter. They simply do not understand that all sports and sporting activities are skills, and that in order to elicit optimal performance in their athletes, coaches need to refocus their efforts on effectively improving sport skill performance. Furthermore, speed development is largely lost on many coaches as well, and the ideal means of improving speed is actually linked directly to the enhancement of

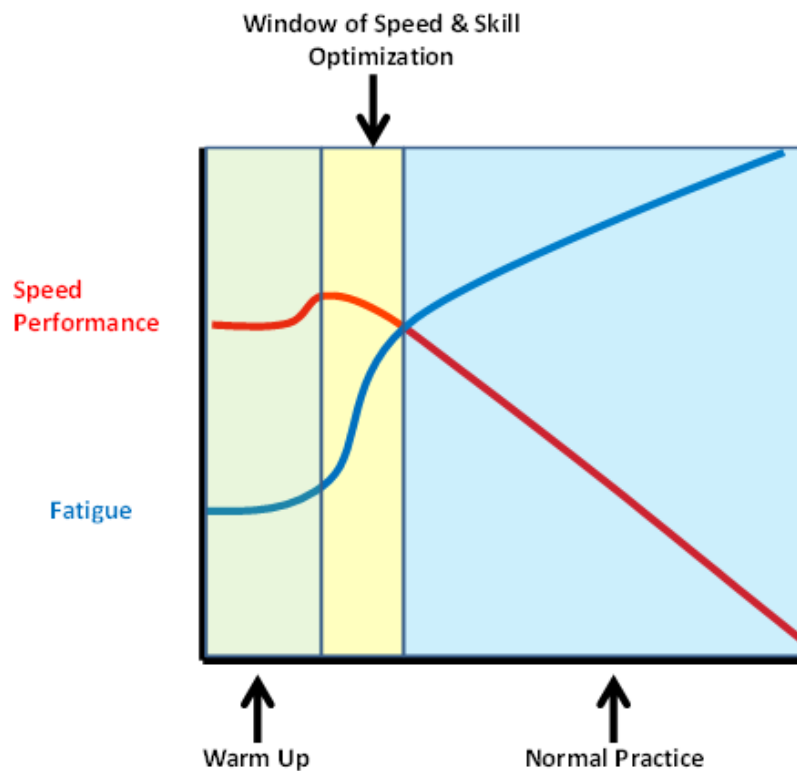
skill performance. There is a small window of time during practice where improvements in both qualities can realistically be made. Outside of this window, gains in speed and skill performance are all but non-existent. The purpose of this essay is to explain how to take advantage of this limited period of practice time where important sport skills can be taught and improved upon, and speed can be developed to levels previously unattained.

The Speed and Skill Training Window

High-level coaches know that the best time to teach a new sporting movement, refine previously-learned skills, or train explosive speed is near the beginning of practice just after the warm-up activities. The reasons why this is so are manifold and largely beyond the scope of this essay. However, it can be pointed out that efforts aimed at skill acquisition and explosive speed enhancement are most effectively performed toward the beginning of a practice session when the athletes have the least amount of fatigue in their neuromuscular systems.[1] When athletes are fresh, particularly when they have been given ample rest from the previous practice session or competition, they are best able to learn and master complex motor skills and withstand the sufficient levels of highly-specific stress required to elicit adaptations in speed performance, especially regarding high-load speed strength. To be frank, a tired athlete is no better than an old dog when it comes to learning new tricks. It is not that his spirit is unwilling, but rather the simple fact that his very physiology limits his ability to learn new skills and achieve higher performance levels of speed when fatigued. Skills are simply outward signs of one's neuromuscular proficiency. When an athlete is rested and ready, he is able to perform the necessary skills with ease and certain mastery that is beautiful to behold. But when an athlete is tired, those same skills become deformed and a mere shadow of their former glory. Elite world champions can be seen to suffer skill performance deficits when they are fatigued. How much more detriment is suffered by young athletes and beginners who have not yet fully mastered the necessary skills for sporting success? Likewise, exhausted athletes never move particularly fast anywhere other than to sit down. A slow and tired athlete cannot achieve the necessary level of speed-specific stress in order to stimulate his body to adapt and improve his speed performance. He will be nothing more than a slow athlete performing slow movements, which

is the antithesis of speed training. A coach that attempts to improve sporting skills and speed performance with fatigued athletes is wasting everybody's time.

Figure 1. *Relationship between Speed Performance, Fatigue, and Portions of Practice*



Optimal Speed Development

For the vast majority of sport, speed is a critical component of success. Teams or individuals may utilize similar strategies and may even possess nearly-identical levels of strength and work capacity, yet one will prevail over the other because of a decisive speed advantage. It is certainly not the only factor in sporting success, but nonetheless it would be foolish for coaches not to address it. The question is how to do so during the limited amount of practice time available. Without delving into the important, yet dense, biomechanical aspects of acceleration, maximum speed, direction change, or even-more-technical discussion of specific sporting movements such as skating, there are many rather general and simple things coaches can do during practice to address the issue of optimal speed development. The key to doing it correctly is to focus on that window of opportunity during practice when speed (and skill)

training can realistically take place. It is important for coaches to understand that this window is not simply the best option among many during practice – it is the only option during practice. A coach cannot hope to improve speed and skill performance outside of a small period of time at the beginning of practice. Human physiology has dictated the terms, and coaches risk precious time and needless injury when fighting against the way the body was built to function.

In order for an athlete to become faster, he must train fast. Now, that incredibly simple statement may seem rather obvious at first, but the truth of the matter is that most coaches have their athletes perform sprints and other workouts at the end of practice, when the only performance quality being improved is work capacity, and even that may be doubtful. In order to force the human body, particularly the neuromuscular system, to build the necessary structures and systems to produce high levels of speed, that body must be subjected to conditions where such levels of speed performance are required. In other words, if a coach wants to train his athletes to be faster, they must be made to move as fast as they possibly can on a regular basis. Only then will their bodies be forced to adapt in response to this new stress. If this still does not seem clear, think about how athletes are trained to become stronger. An individual is given the task of lifting heavy weights on a consistent basis, forcing his body to create new structures and systems (in this case, added muscle size and more efficient neural pathways), in order to cope with the new demand. The result is that the athlete is stronger than he was before. The same holds true for speed. In order to become fast, one must move very fast on a consistent basis.

Most coaches know enough not to prescribe the heaviest weights at the end of a workout session for the simple reason that the athletes will no longer be able to lift them and will be at an increased risk of injury. Heavy weights are needed to stress the athlete, but he must be able to lift them, and do so safely, if he has any hope of forcing his body to adapt and become stronger. Likewise, an athlete cannot achieve the necessary levels of speed required to force his body to adapt and become faster at the end of practice, and any attempts to do so will greatly

increase the odds of catastrophic injury. Again, human physiology has dictated the terms and a wise coach will learn to work within those given parameters.

The start of the window of optimal speed development lies at the beginning of practice just after the warm up. How long that window lasts depends on the athlete's performance. After a finite number of high-quality repetitions, the athletes will begin to slow down. Once slower movement is electronically or even visibly-detected, athletes will no longer be achieving the necessary level of speed performance to stimulate adaptation. Many or even most of the athletes will not be necessarily winded at this point, and may even want to continue. However, any further attempts at improving speed performance will be the equivalent of beating a dead horse. It is simply no longer possible during that practice session. The coach should switch over to other normal practice methods at that point. It is a critical error on the part of coaches to make exhaustion the marker of quality with regard to most forms of training. That may be adequate for improving work capacity, but certainly not speed. The stimulation and fatigue of high-performance neuromuscular systems is the goal, not systemic and general fatigue. Again, a well-trained athlete may not even really notice the moment his structures and systems that govern high-speed performance have fatigued beyond the point of effective trainability. The coach must be confident in his abilities and knowledge of the human body to know when enough is enough.

There are several basic guidelines a coach can follow to maximize the effectiveness of speed training during this small window of time at the beginning of practice. First, it is recommended that you choose a sport-appropriate [agility drill](#) or some form of sport-specific, acceleration-focused drill that lasts between three and eight seconds in total. Perhaps it is prescribing the first five steps of a sprint, fast break, or breakaway in hockey, or maybe it is an agility drill involving a few rapid changes of direction on a football or baseball field. Whatever you choose it is important to make sure that the drill is done with maximum effort and does not last too long. Once the athlete has become visibly slower and has fatigued the neuromuscular system, any further attempts will no longer contribute toward speed development. This is precisely why rest intervals are not merely a good idea, they are required. For a drill lasting five seconds, rest

intervals of 50 to 75 seconds should be prescribed in order to allow for optimum recovery of the physiological systems responsible for short term, high speed movements. The optimal number of repetitions performed by the athletes will vary from team to team and from individual to individual based upon how rapidly or slowly they fatigue and begin to slow, but in general six to eight repetitions of a five-second drill is sufficient for speed development for the vast majority of athletes. For the most part, any speed and/or agility drill will work as long as it is performed with maximum effort and is specific to whatever sport the athletes are engaged in. If a coach decides his team needs more top-end speed, he could prescribe “[flying 60s](#)” or “[flying 90s](#).” Likewise, if the athletes need to improve their ability to accelerate, particularly when changing direction, then a sport-specific [agility drill](#) may provide the necessary stimulation to force performance gains. In order to ease the transition from speed training to normal sport practice, a coach may choose to add a sport implement or specific movement to the end of the final repetition of the drill. For example, a basketball coach may have his athletes receive a pass and take a jump shot at the end of a high-speed drill. By doing so, a coach can help his athletes see the connection between speed and the very same skills necessary for success in their sport. However, there is a limit to how sport- specific a speed drill should be, and using sporting implements such as hockey sticks and basketballs too often can actually slow down the athletes, who instead of focusing on maximum speed performance, begin to worry about how they are handling a puck, football, or basketball. As a result, the athletes are unable to achieve the necessary level of speed to stimulate adaptation and improvement. This defeats the purpose of the drill. It is best to have the athletes remain as focused as possible on maximum effort and speed during the drill, and only toss in a ball or other implement on the last repetition before the rest interval or the transition to normal practice.

Table 1. Guidelines for Duration, Rest Intervals, and Repetitions

| Duration of the Drill | Rest Period | Repetition Guidelines |
|-----------------------|-------------------|-----------------------|
| 3 seconds | 50 to 75 seconds | 8 -12 |
| 5 seconds | 75 to 90 seconds | 6 - 8 |
| 7 or 8 seconds | 90 to 120 seconds | 4 - 6 |

Optimal Skill Development

As stated above, in order to elicit positive in speed and skill performance, both must be trained during that period of time when the athletes are at their neuromuscular and biochemical peak. At first glance, however, it may appear that speed and skill training cannot occur simultaneously, and that time must be added to practice to accommodate both which may preclude other practice activities. In addition, having to choose one form of training over the other, or putting one prior to the other, presents a conundrum. Coaches do not want to sacrifice skill for speed, or vice versa. In reality, both speed and skill development can take place at the same time, during the same window of practice time, without detriment to either. A clever coach will utilize the rest intervals between each repetition of a speed enhancement drill as an opportunity to train a specific skill. This allows for the athlete to remain active during his rest interval, accentuating recovery by boosting venous return among other things, and to make most of his practice time. Using basketball as an example, a coach could prescribe 10 repetitions of a 3-second agility drill with 60 seconds of rest, during which time his athletes perform a low-intensity ball-handling or shooting drill with maximum focus on improving the skill task. Once the athletes begin to slow in their speed drill, or begin to mishandle the ball or miss shots, it is time to move on to other practice activities. In hockey, the athletes could skate with maximum effort and speed through a pattern on the ice for 5 seconds and then work on stickhandling drills during the prescribed rest interval 75 to 90 seconds. By keeping the athletes in a constant state of high-performance, both with regard to speed and skill performance, and by utilizing the optimum period of time at the beginning of practice where each athlete is at his

peak level of readiness for such tasks, a coach can greatly improve the likelihood of his athletes becoming faster and more skilled at the same time. The speed and skill development session comes to an end once the athletes begin to slow down (as measured electronically or visually) and their skill performance begins to suffer (as measured by results).

Installing a Speed and Skill Enhancement Session into a Practice Plan

A normal practice plan typically includes a general-to-specific warm-up to allow the athletes to become engaged in the sport both physically and mentally. In general, warm-up activities consist of some dynamic jogging and walking movements and possibly some dynamic ground exercises as well. Immediately following the warm-up, and prior to other practice activities, coaches should perform eight to twelve minutes of focused and intense speed and skill development using the information above as a guide. Decisions regarding the specific drills to be used are at the discretion of the coach and the specific performance qualities he believes his athletes need to improve upon. During the actual drill, the first athlete (perhaps a captain or veteran member of the team) will perform the activity with maximum effort. Immediately upon completion, he would proceed to a designated area where a very-specific skill, intrinsic to the sport itself, will be performed during the rest interval. If the coach has successfully divided up the team into groups who begin their warm-up at staggered times, or perhaps has set up several of the same stations of the same drill (with other coaches monitoring progress), the first athlete to complete both the speed and skill drills will be properly-rested and ready to perform the second repetition of the speed enhancement drill. Depending on the classification of the athletes a coach is working with (beginner vs. elite veteran), or their present state of preparedness (off-season vs. in-season), the rest interval can be shortened or extended.

Differentiating Speed and Skill Training from Work Capacity Training

It is important to note, once again, that speed and skill training place an entirely different stress on the human body than work capacity training. In other words, the athlete will look and feel very different when training the former as opposed to the latter. Nearly everyone knows what work capacity training looks and feels like. One does not have to work in athletics to know that an athlete seeking to improve his work capacity will perform long intervals of exercise,

numerous repetitions, and appear sluggish, move slowly, and feel very tired when the training is complete. The physiological effects of speed and skill training on the athlete are such that he may not appear winded in the slightest, and may even be eager to continue training with the thought that he has not “done enough” to force his body to adapt. Indeed, many coaches will feel hesitant to stop a drill when skill or speed performance dips the slightest bit, but stop they must! Once speed and skill training begins to resemble work capacity training, one is no longer improving speed or skill and may even be hindering its development. The fact remains that improvement in speed and skill can only become manifest when the athlete is operating at peak neuromuscular and physiological efficiency. He must be fresh and moving as fast as he can in order to yield the desired results. Work capacity training is important as well, and a successful coach knows that he must include it in the training of his athletes. But the best time for such training is at the end of practice, when the athlete can finally empty all of his energy reserves and push his body to its endurance limits, knowing that he will have food and a lengthy rest at the finish line.

5.1 Number of Repetitions for Speed Development

The charts below can be used as guidance when determining the number of repetitions as well as the proper rest times for speed development. The quality of the drill will begin to decrease as athletes are trained beyond these parameters, as athletes will not be fully recovered. This will lead to improving work capacity of the athletes, rather than top end speed.

Level 1 Athlete – A high school or youth that are just beginning their training or are out of shape.

| Duration of Drill | Repetitions | Rest |
|-------------------|-------------|-------------------|
| 3 Seconds | 6 to 8 Reps | 30 to 45 Seconds |
| 5 Seconds | 5 to 7 Reps | 45 to 75 Seconds |
| 7 Seconds | 4 to 6 Reps | 70 to 110 Seconds |

Level 2 Athlete - Any athlete with some training experience working to continue improving.

| Duration of Drill | Repetitions | Rest |
|-------------------|--------------|-------------------|
| 3 Seconds | 8 to 10 Reps | 30 to 45 Seconds |
| 5 Seconds | 7 to 9 Reps | 45 to 75 Seconds |
| 7 Seconds | 5 to 7 Reps | 70 to 110 Seconds |

Level 3 athlete - Advanced and well-conditioned high school athlete.

| Duration of Drill | Repetitions | Rest |
|-------------------|---------------|-------------------|
| 3 Seconds | 10 to 12 Reps | 30 to 45 Seconds |
| 5 Seconds | 9 to 12 Reps | 45 to 75 Seconds |
| 7 Seconds | 6 to 8 Reps | 70 to 110 Seconds |

Administration of Drills

An effective way to set up cone agility drills for a large number of athletes is to first, select the number of drills you want to run, making sure athletes are trained to their left and right. Then, once the drills are set up in the field or the gym have athletes start at each station. This will allow you to have as many athletes completing the drills as possible and will optimize your time. Athletes will each go through their respective stations when the coach gives the start signal. As an athlete finishes the drill they will walk to the next station and wait for their turn, it is important to set the drills up so that athletes are getting proper work to rest ratios.

Coaching points

These cone agility drills never finish where they started or have athletes work back from where they came from, this allows multiple athletes to complete the drill at the same time without a chance of collision. One of the most effective methods for speed development or conditioning is to set your agility drills up next to each other, with one starting line three yards behind the other. This adds a competitive component between the two athletes and allows them to chase each other going through the different drills. Just be sure that the athletes are always competing in these drills in a safe manner that will not lead to any unnecessary injuries.

Articles related to speed and agility training.

[Neural Perplexity](#) - This article is a Training drill, not a speed development method. this can be done during rest period in between your speed and agility drills.

