Coaching Instructions and Cues for Enhancing Sprint Performance

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ABSTRACT

COACHING INSTRUCTIONS AND CUES ARE METHODS OF VERBAL COMMUNICATION THAT CAN BE USED SPECIFICALLY BY STRENGTH AND CONDITIONING AND SPORT COACHES TO FOCUS AN ATHLETES' ATTENTION FOR ENHANCED SPORT PERFORMANCE. SPECIFICALLY, THERE IS EVIDENCE TO SUPPORT THAT PROVIDING ATHLETES EXTERNAL OR NEUTRAL ATTENTIONAL FOCUS INSTRUCTION AND CUES CAN ENHANCE SPRINTING SPEED. THE PURPOSE OF THIS ARTICLE IS TO TRANSLATE THE FINDINGS FROM THE LITERATURE REGARDING THE BENEFITS AND EFFECTS OF COACHING INSTRUCTIONS AND CUES ON SPRINT PERFORMANCE AND TO PROVIDE GENERAL RECOMMENDATIONS FOR ENHANCING ATHLETE SPRINT CAPABILITIES THROUGH THE ADMINISTRATION OF APPROPRIATE VERBAL COMMUNICATIONS.

INTRODUCTION

Strength and conditioning is a profession that largely depends on communication between a coach and an athlete. Verbal instructions, cues, and feedback are essential to the coaching process to communicate appropriate information for enhanced performance. Within the realm of coach-athlete communication, verbal instructions, cues, and feedback are the 3 main types of performance-related communication a coach will use during practice or competition. Although many coaches and researchers use these terms interchangeably, there are distinct differences between them. The operational definition of verbal instructions for this article is medium-to-long task-oriented phrases, generally 3 or more words in length, verbally administered to an individual before the performance of a motor skill. Verbal cues are short task-oriented phrases, generally 1 or 2 words in length (22), verbally administered to an individual before or during the performance of a motor skill. Most verbal cues are verbs, for example "push," "explode," and "drive," and can be used by an athlete as a mantra to focus on and/or repeat during the performance of a motor skill. Finally, augmented verbal feedback is task-relevant information provided during or after (17) the performance of a motor skill by an external source (e.g., coach, video replay) and is supplemental to the naturally available feedback that is available through the athlete's senses (i.e., auditory, tactile, and visual). Collectively, verbal instructions, cues, and feedback provide a framework for coach communication before, during, and after the performance of motor skills.

Despite the role coach communication has on motor skill development, it is still common to hear coaching called as "an art opposed to a science." However, emerging research in the area of motor behavior has provided insights that clarify the scientific underpinnings of effective coach communication. Based on the available findings, this article will focus on the influence of verbal instructions and cues on the performance of motor skills. Specifically, linear sprinting will be emphasized, as it represents one of the most important motor skills in sport. Moreover, being able to sprint faster and more efficiently puts an individual at a considerable competitive advantage (55).

ATTENTIONAL FOCUS: LINKING COACHING INSTRUCTIONS AND CUES TO SPRINT PERFORMANCE

There has been a recent increase in motor behavior publications within strength and conditioning research journals (5,46,47,49,67). The primary emphasis of this research has been to examine the effects of attentional focus on explosive power-based tasks (e.g., sprinting, jumping). From a coaching perspective, instructions and cues facilitate an attentional focus. For the purposes of this article, attentional focus is

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defined by the conscious ability of an individual to focus their attention through explicit thoughts in an effort to execute a task. An athlete's attentional focus can be directed internally on their body movements (i.e., movement process), externally on the effect their movements have on the environment (i.e., movement outcome), or neutrally whereby there is no explicit attempts at conscious focus, instead nonawareness is promoted (19,48,75). For the purpose of this article, we will consider analogies (or metaphors) to fall within the definition of external focus (e.g., "get off the ground fast like you're sprinting on hot coals"), as the analogies suggested within the practical sections of this article do not explicitly call attention to the body (8). For example, a coach instructing the push phase of a sprint may provide an internal cue by telling the athlete to "focus on explosively pushing through their foot," provide an external cue by telling the athlete to "focus on explosively pushing the ground away," or provide a neutral cue by telling the athlete to "complete the sprint as fast as you can." The instructions carry the same message, but the internal cue calls attention to the body (i.e., foot), the external cue calls attention to the effects on the environment (i.e., ground), whereas the neutral cue does not focus attention internally or externally (Figure). It should be noted that analogy instructions and cues allow individuals to implicitly adopt movement proficiency without being explicitly aware of the body movements being performed (1,14); thus, analogy instructions and cues may encourage an external focus of attention by promoting goal-relevant dimensions of the task (25).

Focus of attention has wide spread importance across strength and conditioning, sports coaching, physical education, and physical therapy. Over the past 17 years, the evidence showing the differential role of various attentional foci has grown exponentially (69). Using a ski-simulator task, Wulf et al. (75) published the first experiment describing the differential role of an internal versus external focus of attention. In that study, the internal focus group was "instructed to exert force on the outer foot" and the external focus group was "instructed to exert force on the outer wheels" of the ski-simulator, whereas the control group received no instruction (i.e., neutral focus). This subtle difference in instructions resulted in superior performance for the external compared with the internal focus and control groups, with no difference observed between the internal focus and control groups. More recently, Porter et al. (2015) found that low-skilled sprinters completed a 20-m sprint significantly faster when they were instructed to focus externally "on driving forward as powerfully as possible while clawing the floor with your shoe as quickly as possible as you accelerate" compared with focusing internally "on driving one leg forward as powerfully as possible while moving your other leg and foot down and back as quickly as possible as you accelerate" and neutrally within a control condition where they focused on "running the 20-m dash as quickly as possible." Collectively, a large amount of evidence has extended early findings in the laboratory to a diversity of populations and environments that are relevant to the strength and conditioning coach. Specifically, there is now evidence supporting the use of an external focus of attention across balance and postural control (10,37,59,76,78), plyometric tasks (5,31,46,47,49,67,71,72,79), sprinting (18,52), agility (48), various strength qualities (34,35,63), and a multitude of sport specific skills (3,70,73,74,77,80).

The effects of attentional focus on sport performance can be explained through the constrained action hypothesis (CAH), which states that directing attention externally allows the motor control system to operate under nonconscious automatic processes by which movement occurs reflexively (20,52), leading to superior performance outcomes (29). According to the CAH, when attention is directed internally, the motor control system operates under consciously controlled processes

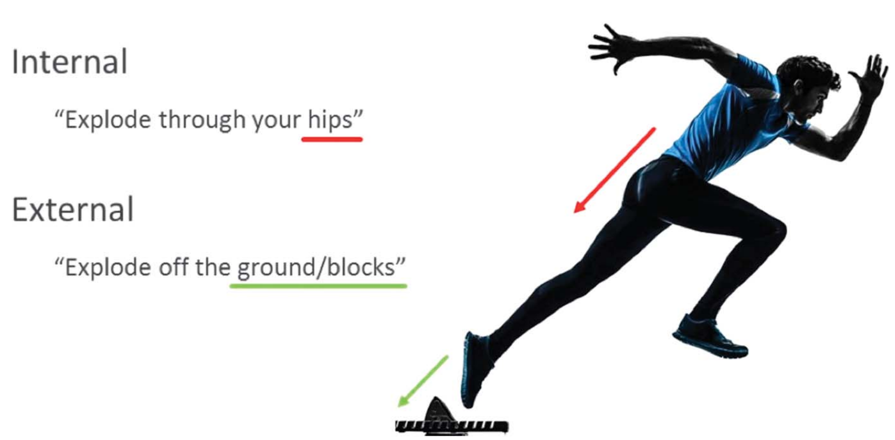

Figure. Internal versus external instructions applied to sprinting.

(i.e., explicit monitoring), potentially invoking working memory (45), which constrains the motor system, leading to less reflexive and fluent movement patterns and poorer performance outcomes compared with an external focus of attention (6,20).

Keeping in mind the research findings regarding attentional focus and performance measures, it seems that using verbal instructions and cues to alter an individual's focus of attention has a meaningful impact on motor performance. The impact that verbal instructions and cues have on performance directly relates to how the coach or sport scientist implements the instructions and cues to the individual, thus affecting one's attentional focus. How the individual consequently focuses their attention can then have an immediate impact on skill performance, in this case on sprint performance.

Despite such potential for improving performance, the literature regarding coaching tactics for sprinting has revealed that coaches may not be regularly providing the most beneficial type of coaching instructions, cues, and feedback to athletes to enhance sport skills. For example, during the 2009 USA Track & Field National Championships, a number of athletes from various events, including the sprints, were surveyed and asked what type of verbal instructions, cues, and feedback their coaches provide to them during training and competition (51). The results of the study by Porter et al. (51) revealed that 84.6% of the athletes reported that their coaches gave instructions, cues, and feedback related to body movements (i.e., internal focus of attention). Consequently, 69.2% of the track and field athletes reported that they adopt an internal attentional focus when participating in track and field competitions. This finding is consistent with the conclusions reported by Williams and Ford (66), which stated that it is not typical for coaches to apply suggestions made by researchers. Possible reasons for a disconnect between what sports science research has found to be effective and the methods adopted by coaches may be the result of multiple factors, including research being too theoretical or impractical, research using tasks that are unrelated to sport performance, and the possibility that coaches are not aware of relevant research (51,66). However, it is clear that sprint performance can be enhanced by simply altering the way instructions, cues, and feedback are delivered to athletes (60).

EFFECTS OF VERBAL INSTRUCTIONS AND CUES ON SPRINT PERFORMANCE

SPRINT TIMES

Changes in sprint performance as a result of instruction and cue provision are likely due to the athlete focusing their attention on their own body movements or specific body parts, on a movement goal or effect, or by simply adopting a nonawareness strategy. When focus of attention is altered, there is likely a subsequent augmentation of biomechanical, physiological, motor learning, or psychophysical outcomes, which will all be discussed later in this article. In regard to providing athletes with instructions and cues to enhance sprint times, there have only been a few studies performed specifically exploring the effects of verbal communication on sprinting speed (Table 1). Currently, the results suggest that the skill level of the athlete may be a factor mediating how the athlete responds to the instructions and cues. For example, Porter et al. (52) found that low-skill athletes benefited most from an external attentional focus (52), whereas Porter and Sims (50) found that high-skill athletes benefited most from no assigned focus (50,60). However, Ille et al. (18) found that expert and novice athletes performed faster 10-m sprint times with an external attentional focus compared with internal and nonassigned conditions. Collectively, the limited evidence provides some preliminary conclusions relative to how coaches should provide instructions and cues. First, there is no evidence within the sprinting literature showing that an internal focus results in superior sprint performance compared with an external or neutral focus (18,32,50,52,60). Second, although some studies have shown that experts perform better while using a neutral focus relative to an external focus (50,68), many studies have shown that experts perform equally well under external focus conditions (62) or even better in some cases (18,74). There is limited evidence to support the use of neutral focus of attention instructions and cues for enhancing novice performance for simple tasks (61). However, there is no evidence to suggest that novices benefit from a neutral focus relative to an external focus particularly for more complex tasks such as sprinting, and therefore, coaches should preferentially use external focus instructions and cues with novice athletes (18,52) until further research clarifies this topic. In summary, novices and experts equally benefit from an external focus relative to an internal focus of attention; however, there may be instances where experts with high motor skill automaticity do not need any explicit instruction (i.e., neutral).

BIOMECHANICAL OUTCOMES

Because there is an absence of literature regarding the effects of various attentional foci on specific biomechanical sprint variables, especially kinetic sprint variables, this section will make suggestions based on the previous literature in motor behavior and biomechanics. With regard to sprinting, numerous biomechanical studies have researched the key performance variables needed to sprint optimally (38,39,53,65). One of the primary methods for enhancing sprint velocity is through the application of large mass-specific ground reaction forces (GRFs), over a minimal amount of time (i.e., 0.101–0.083 seconds) (33) during the stance phase (9,11,64). Skilled sprinters achieve high maximal velocities compared with non-sprinters (10.4 ± 0.3 versus $8.7 \pm 0.3\ m \cdot s^{-1}$) by applying larger vertical ground reaction forces (vGRF) during the first half (2.65 ± 0.05 versus $2.21 \pm 0.05\ N \cdot N^{-1}$ or "bodyweights") of the stance phase

Table 1
Depiction of studies that used internal, external, or neutral instructions or cues to influence sprint performance

Study	Participants	Internal instructions or cues (INT)	External instructions or cues (EXT)	Control ([a]neutral) instructions or cues (CON)	Performance times (s)
Effects of verbal instructions and cues on sprint performance					
Porter and Sims (50)	9 males, skill level: highly trained NCAA division I college football players. Mean age: 21.11 ± 1.22; mean height: 182.04 cm ± 4.25; mean weight: 93.24 kg ± 36.23	While you are running the 20 yard dash with maximum effort, focus on gradually raising your body level. Also, focus on powerfully driving 1 leg forward while moving your other leg and foot down and back as quickly as possible	While you are running the 20 yard dash with maximum effort, focus on gradually raising up. Also, focus on powerfully driving forward while clawing the floor as quickly as possible	Run the 20 yard dash with maximum effort	Times for 18.28 m—INT: 2.92 s ± 0.06; EXT: 2.92 s ± 0.07; CON: 2.90 s ± 0.07
					First 9.14-m split—INT: 1.78 s ± 0.05; EXT: 1.78 s ± 0.06; CON: 1.78 s ± 0.05
					Second 9.14-m split—INT: 1.14 s ± 0.03; EXT: 1.14 s ± 0.03; CON: 1.12 s ± 0.04
					Significant main effect for condition in the second 9.14-m split, $F_{(2,78)} = 3.182$, $P < 0.047$
Ille et al. (18)	16 males, skill level: 8 of 16 were skilled sprinters involved in regional to international competitions. Age range: 20–30	Push quickly on your legs and keep going as fast as possible while swinging both arms back and forth and raising your knees	Get off the starting blocks as quickly as possible, head toward the finish line rapidly and cross it as soon as possible	No instructions other than starting block position and the task goal were provided	Times for 10 m—novices: INT: 1.83 s ± 0.07; EXT: 1.77 s ± 0.08; CON: 1.81 s ± 0.06
					Experts: INT: 1.72 s ± 0.05; EXT: 1.68 s ± 0.06; CON: 1.72 s ± 0.04
					Significant main effect for condition, $F_{(1,14)} = 33.80$, $p < 0.0001$, $\eta_p^2 = 0.69$

Table 1
(continued)

Mallett and Hanrahan (32)	12 sprinters (11 male and 1 female), skill level: sprint-trained athletes with mean 100-m personal bests at 10.86 s ± 0.37, mean age: 21.6 ± 2.4, mean height: 176.4 cm ± 6.8, mean weight: 73.4 kg ± 9.3	None	Push, heel, and claw	No description of the control condition instructions was given for this study	0–30-m race segment—EXT: 4.28 s ± 0.12; CON: 4.36 s ± 0.17
					30–60-m race segment—EXT: 3.04 s ± 0.13; CON: 3.13 s ± 0.20
					60–100-m race segment—EXT: 4.11 s ± 0.17; CON: 4.21 s ± 0.27
					Significant main effect—for condition, $p \leq 0.005$
Porter et al. (52)	84 participants (42 females, 42 males), skill level: none were former high school or current collegiate athletes and had no formal training in sprinting. Mean age: 20.32 ± 1.73	While you are running the 20-m dash, focus on driving one leg forward as powerfully as possible while moving your other leg and foot down and back as quickly as possible as you accelerate	While you are running the 20-m dash, focus on driving forward as powerfully as possible while clawing the floor with your shoe as quickly as you accelerate	Please run the 20-m dash as quickly as possible	20-m times—INT: 3.87 s ± 0.64; EXT: 3.75 s ± 0.43; CON: 3.87 s ± 0.45
					Significant main effect for condition, $F_{(1,83)} = 6{,}565.3$, $p \leq 0.001$

[a]Control conditions in the studies refer to a neutral focus of attention.

during a stride cycle of sprinting (11). Furthermore, elite sprinters have higher hip extension velocity (~835°/s versus ~735°/s) and swing back velocity (~605°/s versus ~450°/s) compared with their slower counterparts (2). Based on the mechanical determinants of maximal velocity sprinting, coaches could use external focus of attention instructions or cues to enhance sprint performance by asking the athlete to "step down hard" or "accelerate into the ground with maximum effort," thereby potentially augmenting the athlete's relative GRFs and subsequent sprint velocity.

Based on the existing literature (58,64,65), it seems that the repositioning of upper and lower body limbs for the subsequent step are largely a reflexive process because of energy transfer rather than by actively moving the limbs into position. Repositioning the limbs more quickly than necessary can result in attenuation of the impulse on the subsequent stance phase, which could have a negative effect of overall sprint velocity and performance (9,64). It would therefore seem more prudent for coaches and sport scientists to focus efforts on providing athletes instructions, cues, and feedback that regard the active (as opposed to passive) processes of the stride cycle (e.g., the down stroke movement of the thigh and hand). For instance, "hammer the nails" could be provided as an analogy instruction to the athlete to allow one to focus externally on the down stroke motion required of the shoulder extension during the stride cycle. However, it should be noted that athletes struggling with the flight phase of the sprint could still benefit from cues focused on knee lift and leg recovery (e.g., "drive your shoe laces to the sky"), as there is no definitive research to show otherwise.

It has been reported that elite 100-m sprinters (those running in the range of 9.90–9.58 seconds) positively accelerate to ~50–70 m into the race (24,30), with the best sprinters accelerating furthest into the race. Therefore, using external focus instructions and cues emphasizing, accelerating as far into the run as possible is suggested, as this technique is applied by elite sprint coaches (e.g., "push as far into the run as possible") (4).

NEUROMUSCULAR OUTCOMES

There have been a number of studies performed showing that providing external focus instructions and cues results in enhanced efficiency at a neuromuscular level. Specifically, an external focus has been associated with lower muscle activation than an internal focus when measured by surface electromyography (28,63,72,80), enhanced running economy (by enhanced oxygen consumption efficiency) (57), promotion of phasic heart rate deceleration just before performing a motor skill (42,54), and reduction in heart rate during physical exertion (40) during a variety of activities. Sprinting is a complex motor skill involving numerous muscle groups that must be contracted at appropriate times and intensities throughout the stride cycle to maximize sprint performance. Thereby, optimizing the timing of agonist and antagonist muscle activation, promoting decreased co-contraction at inappropriate times during the stride cycle may subsequently improve sprint velocity (56). Based on the current literature, external attentional focus instructions have been shown to reduce antagonist muscle activity during motor skill execution (27) and overall muscle activation while concurrently enhancing dynamic motor skill performance (72). There is a potential for external and neutral focus of attention instructions and cues to promote more efficient muscle activation and more optimal timing of the agonist and antagonist muscles involved during sprinting to enhance sprinting ability at a neuromuscular level. However, further research will need to be performed to verify this presumption.

MOTOR LEARNING OUTCOMES

Motor learning literature has shown that providing external attentional focus feedback to athletes results in higher learning rates when compared with an internal focus condition (74). Interestingly, in the study by Wulf et al. (74) it was observed that the withdrawal of internal focus feedback to the athletes enhanced their performance to a point where it was equivocal to that of the external focus instruction group. Such a finding suggests that providing internal focusing feedback had a depressing effect on motor learning. The effects of instructing, cueing, and providing feedback emphasizing external attentional focus can additionally transfer over to novel sport conditions, such as high-stress situations (7,43), which may prevent athletes from choking under pressure in competition settings. Ong et al. (43) found that providing external focus instructions promoted an enhanced rate of skill acquisition while simultaneously resulting in positive performance under pressure, whereas internal focus instructions resulted in a slower rate of skill acquisition and poorer performance under pressure among participants. Based on the existing literature, it seems likely that providing external and/or neutral focus of attention instructions and cues to athletes may result in an expedited motor learning process and an enhanced ability to sprint at a high level under pressure situations such as those experienced when peers are watching and during competition.

PSYCHOPHYSICAL OUTCOMES

Sports science literature has shown that providing external focus of attention instructions and cues can result in a lower rating of perceived exertion (RPE) for athletes (12) and has been shown to reduce the perceived level of difficulty for a practiced task (41,57). Relevant to sprinting, in 2 attentional focus running studies, Ziv et al. (81) and Schücker et al. (57) both found that when participants were given external focus instructions, they had lower RPE scores compared with internal focus instructional groups. Furthermore, Lohse and Sherwood (26) found that individuals had an increased resistance to fatigue when focusing externally rather than internally. With regard to springing, directing attention externally may therefore help promote an improved sprint performance by enhancing an athlete's resistance to fatigue.

PRACTICAL APPLICATION OF VERBAL INSTRUCTIONS AND CUES FOR ENHANCING SPRINT PERFORMANCE

QUALITY OF INSTRUCTIONS AND CUES

Quality refers to the ability of the verbal instructions and cues to achieve the intended result on administration to the athlete. Because providing external focus verbal instructions and cues has been shown to enhance sprint performance (32,50,52,60), while internal focus instructions and cues have been shown to depress performance, the benchmark for quality is evident. Providing external focus of attention instructions and cues may improve novice and intermediate athlete sprint performance, whereas providing external and neutral focus of attention instructions and cues ensures the likelihood that expert athletes will sprint at more optimal levels. Coaches are encouraged to provide external focus of attention instructions and cues to novice and intermediate athletes, while providing external and neutral focus of attention instructions and cues to expert athletes to enhance sprint performance. Verbal instructions and cues should be specific to the phase of the sprint the athlete is to perform (i.e., acceleration, maximal velocity, deceleration–speed endurance) and specific to the areas of improvement the athlete needs to make to improve biomechanical efficiency and thus sprint performance. Examples of quality instructions and cues that can be provided to athletes can be found in Table 2.

Table 2
All verbal instructions provided are either external or neutral

Verbal instructions, cues, and feedback for enhancing sprint performance	
Acceleration instructions and cues	**Maximal velocity instructions and cues**
Push	Slam
Drive	March
Explode	Run tall
Trim the grass[a]	Step over
Push through the post[c]	Step down
Explode off the blocks	Block high[b]
Drive hard out of the blocks	Hit the ground hard
Tear back the track	Hammer the nails
Hammer the acceleration and come up gradually	Accelerate into the ground
Explode off the ground	Explode through the track
Push the ground/track back explosively	Sprint through the finish line
Drive away from the start line as fast as possible	Sprint 3 m past the finish line
Drive out like you are sprinting up-hill	Push into the ground with maximum effort
Explode out like you are being chased	Relax
Explode off the line like a jet taking off	Just sprint as fast as you can
Explode off the line like you are already sprinting	If someone gets in front of you, reel them back in
	Drive off the ground as if to spin the earth backward
	Snap your shoe laces to the sky
	Snap the ground down and back
	Explode off the ground like the crack of a whip
	Sprint like you are in a wind tunnel

[a]Trim the grass refers to the athlete having a low heel recovery on the first few steps of the acceleration in which their toes should "trim the grass."

[b]Block high refers to the thigh blockage happening close to or at 90°, thus allowing for the athlete a longer time to accelerate the thigh back down toward the ground and possibly augment the ground reaction forces during the sprint run.

[c]Push through the post refers to the athlete pushing into the ground in line with the force vectors in which one comes into contact with the ground, thus allowing for efficient force application.

FREQUENCY OF INSTRUCTIONS AND CUES

With regard to frequency of instruction and cues provided to athletes, to the author's knowledge, no studies have been performed with the intent to specifically explore this idea with sprinting. However, the 4 studies (18,32,50,52) that have examined how altering focus of attention effects sprint performance, all provided the verbal cues or instructions before each trial (i.e., 100% frequency). Taking these studies collectively, what is known is that a 100% provision level for external and neutral focus of attention instructions is likely to result in sprint performance improvements dependent on the skill level of the athlete. Therefore, based on the current literature, to enhance the sprint performance of athletes, coaches are encouraged to administer external and neutral verbal instructions to athletes before each sprint repetition. What is not known is how a reduced frequency of verbal instruction and cue administration would affect sprinting ability. For example, what if verbal cues were administered every-other sprint repetition or only once during a set of multiple sprint runs? A number of these issues still need to be clarified. This is an important issue considering that previous research has demonstrated that reducing the frequency of feedback provided after trials results in enhanced learning compared with feedback provided after each trial; furthermore, delaying feedback administration for several seconds has been found to be more effective in promoting learning compared with feedback provided during or immediately after motor skill performance (23). However, Wulf et al. (76) found that a 100% provision rate for feedback was more beneficial for complex motor skills, as has been suggested by Eriksson et al. (15); though, this issue may be dependent on the expertise level of the athlete. Although the research previously mentioned focused on feedback administration, instruction and cue provision is likely to have similar effects on the attentional focus and subsequent performance of the individual.

QUANTITY OF INSTRUCTIONS AND CUES

One area that is underdeveloped in motor behavior literature is how the quantity of verbal instructions and cues affect motor skill performance. In regard to short-term memory, our biological limit is about 4 items (or chunks) of information on average (13). Similarly, it is known that verbal instructions and cues can have an impact on working memory, which is closely tied to the efficacy of motor skill acquisition (36). The conscious processing hypothesis (45) states the load placed on working memory has a direct impact on performance, with internal focus instructions having a greater demand on working memory compared with external focus instructions. As a result, poorer performances associated with the adoption of an internal focus of attention may be the byproduct of increased working memory demands placed on the individual. This may be a result of internal focus instructions and cues in particular, having a larger amount of information (i.e., quantity), which may disrupt working memory by engaging explicit processing of mechanical rules about how to perform sprinting (36), thus potentially causing a decrement in sprint performance. We propose that providing short and concise external directing instructions will lessen the demand that is placed on the athlete's working memory and therefore lead to enhanced sprinting ability.

PROVIDING VERBAL INSTRUCTIONS AND CUES IN PRACTICE AND COMPETITION

Based on the current evidence available, coaches are encouraged to provide either external and/or neutral focus of attention instructions and cues to athletes at 100% frequency levels with the quantity of verbal instructions and cues kept minimal. Verbal instructions and cues used during training should be specific to the biomechanical areas in need of most immediate improvement. The coach should take note of landmark positions in the stance and flight phases of the stride cycle (e.g., toe-on, toe-off, mid-stance, and mid-flight positions). Based on the coach's evaluation of the athletes' mechanics in the various phases of the stride cycle, specific verbal instructions and cues can then be implemented in order of priority. Identification of the mechanical flaw in need of the most improvement should be the top priority for implementation of verbal instructions and cues; identification and improvement of the main biomechanical flaws may augment multiple other biomechanical subareas that may have also been in need of improvement (44). For example, a coach that has an athlete who becomes fully upright within the first 3 steps of the starting blocks during practice may encourage the athlete to "Keep a straight posture while driving out at an aggressively low angle and claw the track back for the first 10–15 m." Encouraging a more straight forward leaning torso angle during acceleration may potentially enhance the orientation of the resultant force vector in the horizontal direction during toe-off and thus may result in faster acceleration velocity as a byproduct of higher net anteroposterior GRF (53), which has been associated with faster sprinting velocity more than less acute torso and shin angles at take-off (16,21).

Because of the nature of competition, stress and anxiety will likely be heightened during these periods, potentially leading to a higher chance of the athlete choking due to the performance pressures (6). Therefore, it is especially important for coaches to be very careful with the quality and quantity of the verbal instructions and cues that are provided to the athlete during competition. Verbal instructions and cues provided during competition should elicit an external or neutral focus of attention and should be brief in nature to enhance sprint performance and to prevent the choking phenomenon from occurring (7,52,60). An example of an external and neutral focus of attention instruction during competition would be "Push through with an aggressive acceleration velocity and stay relaxed during the later stage of the race."

Coaches can implement external and/or neutral focus of attention instructions and cues to enhance sprint performance in athletes by simply encouraging a movement goal while omitting body parts and/or limbs when providing instructions and cues. For example, as opposed to saying to an athlete, "Accelerate your foot down hard into the ground during maximal velocity," the coach could alternatively say, "Accelerate down hard into the ground during maximal velocity." The movement goal is stated and the referencing to body parts is omitted, leading the athlete to potentially focus externally, thus leading to a greater chance for enhanced sprint performance due to enhanced vGRF during maximal velocity.

SUMMARY

In summary, the way coaches provide athletes verbal instructions and cues plays an integral role in the skill development of sprinting. Because sprinting is a critical locomotor skill that is an essential determining factor in numerous team and individual sports, it is imperative that coaches use as many methods as possible to enhance the biomotor ability of speed. As this article demonstrates, providing appropriate verbal instructions and cues is a simple and effective way to enhance sprint performance in athletes. More specifically, the current literature suggests that verbal instructions and cues administered to the athlete should emphasize an external or neutral focus of attention to optimize sprinting performance. However, further research will need to be conducted to determine the mechanisms that underpin how sprint performance changes occur and the extent that instruction and cue frequency and quantity affect sprint performance.

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