

Focus of Attention and Verbal Instructions: Strategies of Elite Track and Field Coaches and Athletes

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It is well documented that directing attention externally enhances motor skill learning and performance under controlled experimental conditions. What is not well understood is how verbal instructions (VI) and feedback provided by coaches in authentic environments influences athletes' focus of attention. Thus, the purpose of this study was to investigate the type of VI and feedback provided by experienced coaches during practice, and how this information influenced elite athletes' focus of attention during competition. Participants were athletes competing at the USA Track and Field Outdoor National Championships. Participants completed a survey inquiring about the VI and feedback provided during practice and what they focused on while competing. The data revealed that 84.6% of the participants reported that coaches provided instructions during practice that promoted an internal focus of attention. Participants also reported they utilize internal focus cues 69% of the time during competition. These results suggest that this sample of coaches provided instructions that focused athletes' attention internally. This practice strategy is inconsistent with motor learning research, which shows learning and performance are enhanced when using an external focus of attention during motor skill execution. Recommendations are made to improve coaching education curriculums, bridging the gap between science and application.

Keywords: coaching, attention, verbal instructions track and field.

Introduction

The expression 'practice doesn't make perfect, perfect practice makes perfect' is commonly used in a variety of sport related context. This expression implies that properly structured practice facilitates motor skill learning, which ultimately culminates in enhanced motor skill performance. Most sports scientists and

coaches agree that the conditions of practice influence motor skill acquisition; because of this, practitioners must take many factors into consideration when creating practice schedules to develop an athlete's performance and prepare him or her for competition (Magill, 1992). Motor learning researchers have investigated many variables to better understand how motor skill learning and performance are influenced through the manipulation of the practice environment. One area of motor learning research that has received a considerable amount of investigation in the past decade is how the focusing of a learner's attention during practice influences motor performance and learning (for a review, see Wulf, 2007a; Wulf & Prinz, 2001). The method that is commonly used to investigate focus of attention involves providing participants with various forms of verbal instruction or augmented feedback, designed to induce either an internal or external focus of attention.

While verbal instructions provide athletes valuable information on how to perform a future sports action, augmented feedback is information that is provided during or after the execution of a skill that is specific to the athlete's current or past performance. Not to be mistaken for sensory feedback, which is information obtained naturally by an athlete through his or her various sensory mechanisms (i.e., vision, touch, proprioception, etc.), augmented feedback is information about an athlete's performance that can only be obtained from an outside source such as a coach (Magill, 2001). It is called augmented feedback because the information provided by the coach "augments" the sensory feedback the athlete obtains naturally. For the purposes of this paper augmented feedback will be referred to as "feedback".

Coaches have two options when providing feedback to their athletes. They can either provide knowledge of performance or knowledge of results feedback. Knowledge of performance (KP) is information an athlete receives about their performance that is specifically related to their movements while knowledge of results (KR) is information the athlete receives about the performance outcome (Magill, 2001). One method of providing KP to athletes is providing them information about the kinematics of their movements. This may include body/limb position, velocity, or acceleration. While KP provides information about movement characteristics of an athlete's performance, KR provides coaches a means of conveying outcome related information to athletes. Examples of outcome related information may include but not limited to: how fast a track and field athlete ran an event, or distance an implement was thrown. Verbal instruction and feedback are important factors for coaches to consider during practice because both can be used to promote an internal or external focus of attention. The type of attentional focus adopted will have a significant impact on performance.

According to Wulf (2007b), an internal focus of attention directs a person's conscious attention to the body's movements or to a specific body part. This is in contrast to an external focus of attention, which directs a person's conscious attention to the effects of movements or specific features in the environment. For example, if a track and field coach desires to improve the speed a sprinter moves their legs while competing in the 100 meter dash they may instruct them to increase the turnover of their leg action. This would likely induce an internal focus of attention because the verbal instructions direct the athlete's attention to the legs. Alternatively, a coach may instruct the athlete to minimize ground contact while running the 100 meter dash, which indirectly encourages the athlete to increase leg speed. Since this form of verbal instruction directs the runner's attention to the result of the movement (i.e., minimal ground contact) it would likely prompt an external focus of attention.

Numerous experiments have been conducted investigating focus of attention and its influence on motor skill performance and learning. The experimental findings have been rather robust in demonstrating that focusing a learner's attention externally rather than internally results in superior motor skill performance (Wulf, 2007a; Wulf, 2007b; Wulf & Prinz, 2001). These findings have been reported for a variety of sport skills requiring the manipulation of an object such as hitting a golf ball to a target (Bell & Hardy, 2009; Wulf & Su, 2007), serving a volleyball to a specific location on the court (Wulf, McConnel, Gärtner, & Schwarz, 2002, Exp. 1), and basketball free-throw shooting (Al-Abood, Bennett, Hernandez, Ashford, & Davids, 2002). In addition to tasks requiring object manipulation, inducing an external rather than internal focus of attention has also been shown to improve balance (Wulf, Weight, Poulter & McNevin, 2003) and whole body power related movements such as vertical jumping (Wulf, Zachry, Granados, & Dufek, 2007), horizontal jumping (Porter, Ostrowski, Nolan, & Wu, in press), and agility (Porter, Wulf, Nolan, & Ostrowski, 2010).

To explain this performance and learning phenomenon, Wulf, McNevin, & Shea (2001) proposed the constrained action hypothesis. It suggests that focusing on the effects (i.e., external focus) of a movement allows motor behaviors to happen automatically or with unconscious motor control. However, when individuals focus on the movements of their body (i.e., internal focus) they interfere with the automatic processes of motor behavior. The interference that results from this conscious control of the motor control system results in decreased accuracy, reduced power output, slower movements, and overall depressed motor performance (Wulf, 2007a).

Motor learning experiments have consistently demonstrated a superior learning and performance effect when participants are prompted to use an

external rather than an internal focus of attention. What is not well understood is how verbal instructions are currently used by coaches in real world or competitive venues. Specifically, it has not been scientifically documented how coaches utilize verbal instructions and feedback to influence an athlete's focus of attention during competition. Based on the vast amount of existing empirical evidence, an athlete's best performance would occur when they are using an external focus of attention. In order for this to happen, a coach must provide appropriate verbal instructions or feedback during practice and competition to prompt the athlete to focus externally. An alternative conclusion that can be drawn from existing research is if coaches are providing verbal instructions and feedback that induce an internal focus of attention, which likely constrains motor behaviors, they are causing the athlete to have a less than optimal performance.

The primary aim of the current study was to measure how verbal instructions and feedback provided by coaches during practice influenced the focus of attention of athletes during competition. In order to achieve this, we first investigated the type of verbal instructions and feedback experienced coaches provided to elite track and field athletes during practice. Second, we determined how the instructions and feedback, provided during practice, influenced athletes' attentional focus during competition. Based on the structure of track and field coaching education in the United States, which traditionally contains minimal emphasis on motor learning and control principles and a primary focus on physical training and biomechanics, we hypothesized that athletes would report their coach provided verbal instructions and feedback during practice that referenced specific body parts or body movements. It was also hypothesized that athletes would focus internally during competition due to the verbal instructions and feedback provided during practice.

Method

Participants. Participants ($N = 13$) were adult male and female United States of America (USA) track and field athletes competing at the USA Track and Field Outdoor National Championships hosted in Eugene, Oregon, USA. In order for an athlete to compete at the USA Track and Field Outdoor National Championships, they must qualify in their specific event at an outdoor track and field meet sanctioned by USA Track and Field in the concurrent outdoor season of that year's outdoor championships. The top finishers in each event at the USA Track and Field Outdoor National Championships qualify to represent the USA at the International Association of Athletic Federations (IAAF) World Championships in Athletics. Or, as is the case every fourth year, the athletes whom are the top finishers at the USA Track and Field Outdoor National Championships represent the USA at the summer Olympic Games. Because of

these criteria, we considered the athletes who participated in the current study to be highly skilled or elite; we also considered the coaches who worked with these athletes to be highly skilled or elite coaches.

The sample of athletes surveyed for the current study competed in a variety of events, including the following: 400 m hurdles, 800 m run, 1600 m run, 5000 m run, 100 m sprint, 200 m sprint, javelin, triple jump, and decathlon. All experimental methods were approved by a university Institutional Review Board. All participants were naive to the purpose of the study.

Procedure. During the USA Track and Field Outdoor Championships, all athletic events were video taped by a trained videographer and stored for later viewing by the athletes, coaches, and sports scientist working with USA Track and Field. The USA Track and Field Outdoor Championships span multiple days; throughout the meet, athletes were offered the opportunity to view their recorded performances at a facility near the track and field stadium. Athletes were not required to view their performances; rather they were allowed to view their performance if they choose or if their coach recommended they do so. While in the video viewing facility, all athletes were provided the opportunity to complete a short survey provided by the authors of the current study.

The first question on the survey asked: “What does your coach tell you to focus/concentrate on the most when you are practicing your technique?” Athletes were then asked to select one of the following options: 1. How your body, legs, and/or arms are moving or should move. 2. Important locations/ areas in the surrounding environment. 3. The implement you are using (if you use one for your event). 4. Equally distributed between the options above. The second question on the survey asked, “What are the only things you think about while you are competing?” This was an open-ended question and athletes were allowed to write in a response to the question. The third and final question on the survey asked, “When your coach provides feedback during practice, most of the time your coach gives you advice about:” Athletes were then asked to select one of the following options; 1. The end result of your performance (for example: time you ran, distance you jumped or threw). 2. Specific information about your performance (for example: joint angles, movement speeds, what your body is doing, what your arms or legs are doing). 3. Equally distributed between the two options above. Once participants completed the survey they placed them into a collection box for storage and later analysis by the authors.

Results

The questionnaire described above was used to assess three separate questions. First, athletes identified what their coaches directed their attention toward during practice. Secondly, an open-ended question assessed what athletes actually focused on during competition. The responses to the second question were read by the first and third authors and categorized by the type of attentional focus. For example, if an athlete indicated that their focus was on long-jump mechanics, the response was categorized as an internal focus. Alternately, if an athlete stated they focused on the result of their jump, the response was categorized as an external focus. For the final question, athletes were asked to identify what types of augmented feedback were typically provided by their coaches during practice. Frequency scores were calculated for each questionnaire item.

Coaches' Instructions During Practice. Three categories of coaches' instructions to athletes were provided to participants for the first question: internal focus, external focus, or a combination of both internal and external focus. The data revealed that 84.6% (n=11) of the participants reported that verbal instructions from their coaches instructed them to exclusively focus their attention internally - on how their body and/or limbs move. The remaining 15.4% (n=2) indicated that their coaches' instructed them to focus on both internal and external factors, while no participants reported being told to exclusively focus their attention externally.

Athletes' Self-Reported Attentional Focus During Competition. The second question on the survey was open-ended, and asked participants to write down what they think about while competing. The first and third authors read and coded the responses to identify what type of attentional focus was being described: internal focus, external focus, or switching between internal/external. Results indicated that the majority of participants reported utilizing internal cues, such as focusing on the movements of the skill (69.2%, n=9), while only 7.7% (n=1) of the sample used external cues, 15.4% (n=2) switched between internal and external attentional focus, and one participant did not provide a response (7.7%).

Augmented Feedback Provided by Coaches. The final survey question asked participants to indicate what kind of augmented feedback coaches provided most of the time during practice sessions: knowledge of performance (KP), knowledge of results (KR), or an equal combination of KP/KR. Data indicated that within this sample, 23% (n=3) of coaches provided KR, while 38.5% (n=5) provided KP, and the same percentage (38.5%; n=5) gave a combination of KP/KR to participants during practice sessions.

Discussion

The primary aim of the current study was to empirically document how verbal instructions and feedback provided by track and field coaches under real-world conditions influenced athlete's focus of attention in a competitive venue. Data were gathered through the use of a three-question survey provided to elite athletes competing at the USA Track and Field Outdoor National Championships. We hypothesized that athletes would report receiving instructions and feedback during practice that referenced specific body parts or body movements. According to Wulf (2007a), providing this type of information via verbal instruction and feedback would likely induce an internal focus of attention. Based on this, we also hypothesized that the instructions, provided by coaches, would then cause athletes to focus their attention internally during competition. The results of the current study support both hypotheses. Specifically, when participants were asked "what does your coach tell you to focus on the most when you are practicing?" participants reported that their coach instructed them to focus their attention internally (i.e. on how their body and/or limbs move) 84.6% of the time. In addition, when participants were asked to report what they think about when they compete they reported they focus on internal cues 69% of the time.

The final question of the survey asked about the type of feedback coaches provided during practice. Some athletes (n=5, 38.5%) reported that their coaches provided mostly movement related feedback or KP (i.e. joint angles, movement speed, and body/limb movements) during practice. This type of feedback likely induces an internal focus of attention as it references specific locations of the body and their respective movements. Fewer athletes (n=3, 23%) reported their coach provided feedback regarding the results of their performance or KR. Since the content of this information references the result of movement, we concluded this information would likely induce an external focus of attention. Finally, five athletes (38.5%) reported their coach provided an equal distribution of feedback relevant to body movement characteristics (KP) and movement results (KR). Based on the results of the final question on the survey we concluded that when coaches provided feedback to athletes it often contained information that likely prompted the athlete to focus internally rather than externally.

Motor learning and control research has consistently demonstrated that prompting an external rather than an internal focus of attention leads to superior motor skill learning and performance (Wulf, 2007a; 2007b). This effect has been demonstrated using a variety of sport related skills requiring the successful manipulation of an object (Al-Abood et al., 2002; Bell & Hardy, 2009), and power skills requiring body transport (Wulf et al., 2007; Porter et al., in press). The sport of track and field is comprised of a variety of events; some

of which require the athlete to manipulate an object (e.g., shot put, discus, and javelin) and others require powerful whole body movements to transport the body from one location to the other (e.g., 100 meter dash, long jump, and hurdle jumping). If inducing an external focus of attention has been shown to improve the performance of a wide variety of motor skills, then it is likely that adopting an external focus would also enhance motor skill performances associated with the events of track and field. However, the results of the current study suggest that elite level track and field athletes generally used an internal focus of attention while competing. It is our contention that this attentional strategy was facilitated by verbal instructions and feedback provided by their respective coaches during practice. Based on the findings of the current study, it appears there is a lack of connection between what the scientific literature recommends and what experienced coaches are doing in practice when working with elite athletes. A question that arises from our findings is; could the performance of the sampled elite athletes be enhanced by utilizing an external rather than an internal focus of attention? This question can only be answered through future experimentation. However, numerous research findings, using a variety of tasks, suggest that prompting performers to focus externally significantly enhances motor skill performance.

Another pertinent question that arises from the results of this study is why coaches are providing instructions and feedback that contradict the scientific literature? According to Williams and Ford (2009), it is not common for coaches to read motor learning research, nor is it common for coaches to embrace the suggestions made by scientists. A suggested reason to explain why motor learning research does not catch the interest of coaches is because it is often theoretically driven and has very little, if any, direct application to authentic athletic settings, especially when working with elite athletes (Ericsson & Williams, 2007). In addition, Williams and Ford (2009) propose that the creation of efficient and effective practice environments is often perceived to be the role of the coach. Thus coaches may feel that sport scientist have no meaningful information to offer them, causing a lack of interest in scientific literature. Based on these suggestions, we conclude that the athletes sampled in the current study were provided verbal instructions and feedback by their coaches that induced an internal focus of attention simply because their coaches were not aware that doing so may depress performance.

An alternative explanation for the gap between motor learning and control findings and track and field coaching has been provided by Porter et al. (in press), who suggest that many popular books and training manuals used to educate strength and conditioning coaches do not address the use of an external focus of attention to enhance athletic performance. A review of several published books

(Bowerman & Freeman, 2008; Carr, 1999; Guthrie, 2003; and USA Track & Field, 1999) used to educate track and field coaches revealed a lack of content related to the performance effects of an internal or external focus of attention. The results of our review support the findings of Porter et al. (in press). Specifically, an examination of the materials (Bowerman & Freeman, 2008; Carr, 1999; Guthrie, 2003; and USA Track & Field, 1999) related to educating track and field coaches did not reveal any content that addresses the learning and performance benefits of verbal instruction and feedback to promote an external focus of attention. Our review of these materials also revealed that many of these books focused primarily on the physical training of the athlete and contained a strong emphasis on biomechanics or movement related information. With such a strong emphasis on mechanics, it is not surprising that coaches working with athletes sampled for the current study tended to provide instructions and feedback related to specific body parts and body movements which led to the athletes using an internal focus during competition. While the track and field coaching literature provides extensive descriptions for optimizing various movements within each event, the literature fails to provide evidence-based methods to teach or convey this information to athletes. More importantly, a review of the USA Track and Field coaches' education curriculum revealed a lack of motor learning and control within the curriculum. While the certification offers sports science content in exercise physiology, biomechanics, and sport psychology, there is currently no motor learning and control content to instruct coaches how to teach motor skills to their athletes.

The results discussed make a unique contribution to the field of sports science and coaching education by providing initial empirical evidence for the manner in which coaches provide verbal instruction. Moreover, this study identifies how elite level track and field coaches utilize verbal instruction and feedback strategies in practice environments to create an internal focus of attention during competition. Alas, these findings suggest that elite level track and field coaches are using practice strategies that contradict recommendations in motor learning and control research. We conclude that the coaches who worked with the surveyed athletes did not attempt to elicit an external focus of attention in their athletes because they were likely unaware of the relevant scientific literature and were likely never educated on the benefits of using such practices. This conclusion highlights the need to offer coaches better education materials that not only highlight the biomechanics of an event but also provides motor learning and control recommendations to properly coach and instruct movement related information. In order to produce coaching education materials that contain evidence based strategies on instruction, governing body organizations, coaches, and sport scientists must work together to promote

research dissemination, create applied research methodologies, and foster collaboration that is specifically aimed at improving sports performance.

While the current study provides an initial view into how coaches are providing instruction to athletes, there are some limitations to the findings reported here, which raise questions to be addressed in future studies. For example, future studies should sample a larger population of athletes; doing so will increase the generalizability of the findings reported above. In addition, to validate the findings reported here, future investigations should directly observe and measure the instructions and feedback provided in authentic practice conditions instead of depending on the athlete to recall this information at a later date. It will also be valuable to sample athletes involved in other sports, such as baseball, soccer, and basketball. Sampling athletes in other sports will indicate if the findings reported here are unique to the sport of track and field or are also observed in other athletic settings. The method used in the current study only surveyed American athletes who primarily worked with American coaches. Future studies should sample athletes from other countries, which will indicate if athletes from other countries also report using an internal focus of attention during competition as a result of the verbal instructions and feedback their coach provided during practice.

The approach used in the present study only surveyed the perspectives of athletes. Consequently, surveying coaches for their preferred strategy of providing instruction and feedback to athletes would provide valuable data by extending our understanding of why coaches provide one type of information instead of another. It will also be valuable for future studies to interview coaches to better understand how they are educated on the topics of delivering verbal instructions and feedback. Doing this will provide invaluable data to guide and develop coaching education curriculums that will enhance the knowledge and techniques of all coaches. Greater efficiency and effectiveness within the practice environment, due to properly educated coaches, will result in enhanced athletic performance.

In conclusion, the present findings suggest that USA track and field coaches contradicted the motor learning research, which supports the use of verbal instruction and feedback to promote an external focus of attention. Instead, coaches utilized verbal instructions and feedback, during practice, in a manner that promoted an internal focus of attention while competing. A review of available track and field coaching education materials suggest coaches are likely not educated on how to effectively relay verbal information and feedback to athletes. Another explanation for the observed findings is that motor learning researchers have done a poor job of reaching out to coaches to communicate

how to use validated scientific concepts to enhance athletic performance. To solve this problem, it is proposed that sport scientists work in conjunction with not only coaches but with organizations and publishers to create coaching education materials. Sport scientists must also continue to attend coaching related workshops and conferences, not only to present their work but also to listen to the needs of the practitioner. This will help scientists create evidence-based methods that meet the specific needs and demands of coaches. The result of this effort will ensure that coaches are using current and validated scientific principles during practice, which in turn, fosters enhanced performance during competition.

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