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Coaching cues in amateur boxing: An analysis of ringside feedback provided between rounds of competition

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A B S T R A C T

Feedback is commonly employed to enhance motor learning and performance. While numerous studies have investigated the causal effects of feedback on motor learning, an analysis of real-time feedback provided during training and competitive sporting environments is lacking. Therefore, the feedback provided by 12 boxing coaches to athletes between rounds of the 2015 Australian Boxing Championships was recorded and transcribed. The feedback statements were then analyzed according to three feedback variables that have been shown to be critical for optimizing performance: Attentional focus (external, internal, neutral), autonomy support (autonomy-supportive, controlling, neutral), and feedback valence (positive, negative, neutral). Collectively, 445 feedback statements provided during 25 bouts, of which 14 were won and 11 were lost, were analyzed for each of the three categories. Coaches provided on average 8 feedback statements per round. Excluding neutral statements, coaches delivered more internal (15%) compared with external focus feedback (6%), more controlling (53%) compared with autonomy-supportive feedback (6%), and more positive (29%) relative to negative feedback (12%). Furthermore, during winning bouts coaches delivered less internal (12% vs. 19%), less controlling (48% vs. 58%), and more positive (36% vs. 18%) feedback, when compared with losing bouts. These results demonstrate for the first time the type and frequency of feedback delivered during amateur boxing bouts. While these findings may or may not reflect causal relationships, it is interesting that feedback that has been found to enhance motor performance was more often used during winning rather than losing bouts.

1. Introduction

In the field of motor learning, the term augmented feedback refers to information provided by an external source, such as a coach, training apparatus, or video (Hodges & Williams, 2012; Lauber & Keller, 2014). Over the past few years, numerous experimental studies have shown that the effectiveness of augmented feedback (or just feedback) primarily depends on three factors (Wulf & Lewthwaite, 2016), including the type of attentional focus it induces (internal vs. external focus); the extent to which it supports the performer's need for autonomy (autonomy-supportive vs. controlling); and its valence (positive vs. negative). In the following sections, we describe research findings related to these three factors. We then report on a study in which we recorded and analyzed, with respect to each factor, the verbal feedback boxing coaches provided to their athletes between competitive rounds of the 2015 Australian Boxing Championships.

1.1. Attentional focus

How feedback directs an athlete's focus of attention has been shown to play an important role for the performance as well as learning of sport skills (Wulf, 2013). Specifically, providing instructions that lead individuals to focus on a body part – resulting in an *internal* focus of attention – hinders performance. Conversely, instructions that direct performers' attention to the intended effects of their movements (e.g., a dart hitting a target) – resulting in an *external* focus – enhance performance and learning. For

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example, focusing on the movement of the wrist during a basketball shot has been found to impair shooting accuracy relative to a focus on the hoop (Zachry, Wulf, Mercer, & Bezodis, 2005). Accuracy in dart throwing has also been improved with an external focus on the dart or target (Lohse, Sherwood, & Healy, 2010; Marchant, Clough, & Crawshaw, 2007). Likewise, force production is affected by the attentional focus. Maximum vertical jump height (e.g., Wulf, Dufek, Lozano, & Pettigrew, 2010) or standing long-jump distance (e.g., Porter, Ostrowski, Nolan, & Wu, 2010) increased when an external focus was adopted rather than internal focus (and no instructed focus). Discus-throwing performance has been demonstrated to benefit from external focus instructions (Zarghami, Saemi, & Fathi, 2012). Also, greater forces were produced with external focus in single joint (Marchant, Greig, & Scott, 2009) and multi-joint exercises (Halperin, Williams, Martin, & Chapman, 2016). As exercises are executed more efficiently with an external focus (e.g., on the weight lifted), muscular endurance in trained individuals is reported to increase (Marchant, Greig, Bullough, & Hitchen, 2011). The benefits of external focus for movement effectiveness (e.g., accuracy, balance) and movement efficiency (e.g., force production, speed, endurance) generalize across tasks, skill levels, and age groups (Wulf, 2013).

According to the constrained action hypothesis (Wulf, McNevin, & Shea, 2001), an internal focus promotes a conscious type of control, causing individuals to constrain their motor system and interfere with automatic control processes. In contrast, an external focus promotes a more automatic mode of control by utilizing unconscious, fast, and reflexive control processes. Several studies have provided evidence for increased automaticity with an external focus by showing reduced attentional-capacity demands (Kal, Van Der Kamp, & Houdijk, 2013), high-frequency movement adjustments (McNevin, Shea, & Wulf, 2003), and reduced pre-movement times, representing more efficient motor planning (Lohse, 2012).

The performance advantages resulting from an external focus are often seen immediately (Halperin, Chapman, Martin, & Abbiss, 2016; Marchant et al., 2009; Porter, Anton, & Wu, 2012). Therefore, coaching cues that refer to body parts or movements, for example, during a boxing bout would not be expected to be optimal for the athlete's subsequent performance.

1.2. Autonomy support

Feedback allowing participants to make choices and exert control over practice environments typically results in enhanced learning and performance, when compared with controlling feedback, absent of choices and/or a sense of control (Teixeira, Carraça, Markland, Silva, & Ryan, 2012; Wulf, 2007). For example, allowing participants to choose when to receive feedback has been found to enhance the learning of movement form in overhand throwing (Janelle, Kim, & Singer, 1995), and a serial martial art sequence (Lim et al., 2015). Similarly, allowing learners to decide on the number of basketball shots to be completed (Post, Fairbrother, & Barros, 2011), when to view video demonstrations of the skill (Wulf, Raupach, & Pfeiffer, 2005), or the order of balance exercises (Wulf & Adams, 2014) leads to more effective learning compared with control conditions without choices. Interestingly, even giving individuals choices that are incidental to the task has a positive effect on learning (Lewthwaite, Chiviacowsky, & Wulf, 2014).

Autonomy-support also includes providing a rationale, asking for an opinion, or making a suggestion. There is evidence indicating that the type of instructional language (i.e., autonomy-supportive versus controlling) has an impact on motor learning (Hooyman, Wulf, & Lewthwaite, 2014). Hooyman and colleagues varied the way in which instructions for performing a novel task (cricket bowling action) were presented. Autonomy-supportive language, that is, instructions that gave the participant a sense of choice (e.g., “When starting the approach of the pitch you may want to cradle and deliver the ball in a windmill fashion so the ball travels over the shoulder and not to an angle or to the side.”), led to superior learning than controlling language that offered little leeway for how to execute the skill (e.g., “When initiating the approach of the pitch you must cradle the ball so it travels in a circular pattern. At the apex of the pitch the ball must be directly over the shoulder. Do not throw it at a side angle.”). Throwing accuracy was higher for the group that received autonomy-supportive rather than controlling language instructions.

Allowing individuals to exercise control over the environment satisfies a basic psychological need for autonomy (e.g., Deci & Ryan, 2000, 2008). Supporting performers' need for autonomy has consistently been found to have positive effects on motor learning, independent of which factor the learner is given control over, and the benefical effects on performance are sometimes seen immediately (Wulf & Adams, 2014). The benefits of autonomy support are robust and generalize across tasks, age groups, populations, etc. (see Sanli, Patterson, Bray, & Lee, 2013). It is interesting to note that providing autonomy support also enhances performers' motivation to engage in exercise activity (Wulf, Freitas, & Tandy, 2014). Thus, respecting athletes' need to be autonomous would seem to be important not just in practice or training sessions, but possibly in competitions as well.

1.3. Feedback valence

Lack of confidence or concerns about one's capabilities are not conducive to optimal performance. Over the past few years, there has been converging evidence that practice conditions that enhance learners' expectancies of future performance result in improved performance as well as more effective learning (e.g., McKay, Lewthwaite, & Wulf, 2012; Palmer, Chiviacowsky, & Wulf, 2016; Trempe, Sabourin, & Proteau, 2012; for a review, see Lewthwaite & Wulf, 2012). Some of this research has specifically investigated the effects of feedback valence. It has been shown, for example, that feedback emphasizing successful rather than unsuccessful performances enhances motor learning (e.g., Chiviacowsky & Wulf, 2007). Subsequent studies demonstrated increases in performers' intrinsic motivation (e.g., Saemi, Wulf, Varzaneh, & Zarghami, 2011) and perceptions of competence or self-efficacy (Badami, Vaezmousavi, Wulf, & Namazizadeh, 2001; Saemi, Porter, Ghotbi-Varzaneh, Zarghami, & Maleki, 2012) resulting from positive feedback Furthermore, positive social-comparative feedback has been found to enhance movement accuracy (McKay et al., 2012), performance in a continuous submaximal force production task (Hutchinson, Sherman, Martinovic, & Tenenbaum, 2008), and balance (Lewthwaite & Wulf, 2010). Importantly, the performance benefits resulting from positive feedback generalize to experienced athletes. In one study, positive feedback improved running economy among trained runners relative to a control condition (Stoate, Wulf, & Lewthwaite, 2012).

Feedback has an influence on individuals' expectancies – which are an important factor in motor performance contexts. Indeed, enhanced expectancies resulting from positive feedback have consistently been found to be more effective for subsequent performance and learning than reduced expectancies resulting from feedback highlighting errors, or even “neutral” control conditions. High performance expectancies appear to prepare the performer for successful movement through diverse effects at cognitive, motivational, neurophysiological, and neuromuscular levels – ensuring what Wulf and Lewthwaite (2016) termed *goal-action coupling*. Higher performance expectancies are assumed to serve as protection against responses that would detract from optimal