The intricacies of verbalizations, gestures, and game outcome using sequential analysis

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ARTICLE INFO

ABSTRACT

Objectives: The purpose of the present study was to identify the intricacies of verbalizations, gestures, and game outcome during competition.
Design: The behavioral research software Observer XT® using sequential analysis was used to analyze our data.
Method: Participants were 34 junior tennis players with a mean age of 13.68 (SD = 1.8). Youth players were observed during 17 matches using the Self-Talk and Gestures Rating Scale and were examined by a built-in application (Observer XT®) of mapping of verbalizations, gestures, and performance.
Results: Sequences indicated negative verbalizations were the most frequently exhibited form of overt verbalizations, followed by positive and instructional verbalizations. Furthermore negative verbalizations for either the server or the receiver decreased the probability of winning a game and showed verbalizations from the server related to the receiver's verbalizations and game outcome, and vice versa.
Conclusions: The results shed light on how verbalizations and gestures interact differently according to the context, which may have important implications for research that has focused on verbalizations and has neglected gestures and contextualized performance in sport.

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The link between thought and action is a subject for inquiry from philosophy (Plato, trans. 1993) to pioneer cognitive psychologists (e.g., Neisser, 1967). Vygotsky (1986) argued that "the area of inner speech is one of the most difficult to investigate" (p. 226). Furthermore, Davids and Araújo (2010) proposed that research should not solely focus on the role of conscious mental life but also on the role of the environment in regulating thoughts and behavior. Eccles (2012) in his review on verbal reports noticed that researchers should take into consideration the conditions under which participants can provide useful responses of their cognitive processes. Davids and Araújo (2010) were aligned with Reed (1996) who argued that verbalizations, expressed following appropriate

procedures, are a means of selecting and making information available to others and to oneself. Verbalizations refer not only to inner representations but also to environmental situations and states of affairs that the person who verbalizes is presenting to others (Reed, 1996). When people verbalize their thoughts they frequently gesture. Gestures and verbalizations have been assumed to reflect a person's feelings and emotions (e.g., Beilock & Goldin-Meadow, 2010) and these verbalizations affect not only the speaker but also the listener (e.g., Goldin-Meadow & Alibali, 2013). Furthermore, Beilock and Goldin-Meadow (2010) relying on the embodied-cognition framework (e.g., Wilson, 2002), revealed that gestures had an effect on one's subsequent performance. Sport competition is a context in which numerous gestures and verbalizations occur in different moments under different situations. Thus, based on Beilock and Goldin-Meadow's (2010) results and their suggestions that the mechanisms underlying the relationships between one's gestures and thoughts are unclear (Goldin-Meadow & Beilock, 2010), our wider aim was to examine the interplay between an athlete's gestures and verbalizations and their effects on the opponent's gestures, verbalizations, and performance in the

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naturalistic setting of tennis competition based on an ecological and embodied theoretical approach (Gibson, 1979).

Ecological approach and verbalizations

The ecological approach assumes that knowledge about the world is actualized through the complex and ever-changing relationship of person-as-knower to the environment-as-known. This approach calls for a complete understanding of the informational aspects of the ecological niche, as well as the behavioral consequences of such information, thus bridging the alleged gap between perception, action, and knowledge (Gibson, 1979). Gibson (1966) distinguished between *knowledge of* the environment (perception based on information to control action, which constrains actual action; for example, "what do I do to achieve a certain goal when I'm playing the tennis point?") and *knowledge about* the environment (perception mediated by language, pictures and other symbols, which constrains future action; for example, "what can I tell you, or show you, now, that I'll do in the next tennis point?"). This distinction has profound implications in sport (see Araújo, Davids, Cordovil, Ribeiro, & Fernandes, 2009). Performers can perceive themselves, their environments, and the changing relationship between themselves and their surroundings. The perception of the action possibilities of the environment is what Gibson means by "knowledge *of*" the environment. It is not formulated in pictures or words, for it is this knowledge that makes the formulation of pictures and words possible. Information is available in the environment, and it can be picked up by many observers. On the other hand, images, pictures, and words afford a mediated, indirect knowledge, that is, knowledge about the world (Gibson, 1979). This kind of knowledge is intrinsically shared, because it involves displays of information to others. Verbalizations and gestures are examples of this. The value of these sentences with selected samples of information about the ecology does not lie in the words themselves, but in what they refer to in the circumstances they are expressed. They consolidate gains of perception by converting tacit knowledge into explicit knowledge (Reed, 1991). The role of explicit knowledge, and the processes that make knowledge explicit, is not to create knowledge out of merely potentially meaningful input, nor even to select meanings to assign to inputs. The role of explicit knowledge, as Goldin-Meadow and Beilock (2010) argue, is to make others, and maybe the speaker him/herself, aware. Gestures and verbalizations are means to share knowledge. The question is how functional (i.e., beneficial for performance) this is, for the one who shares. Based on this theoretical rationale it was expected that the relationship between gestures, verbalizations, and game outcome to be dependent on circumstances.

Gestures and verbalizations

Individuals use gestures when they talk and these gestures may facilitate speaking (Iverson & Goldin-Meadow, 1998). Gestures have been found to play an important role in a variety of settings and domains (for review see, Goldin-Meadow & Alibali, 2013). For example, in a recent meta-analysis conducted by Hostetter (2011) a moderate effect size of the beneficial effect of gestures on language comprehension was found. Recently, Beilock and Goldin-Meadow (2010) argued that gestures "force" people to think with their hands. They also suggested that one's own gestures can have an impact on one's subsequent performance and that they can facilitate thinking. More specifically, they revealed that gesture's effect on thought was not carried by speech but gesturing had an effect on performance. However, as Goldin-Meadow and Beilock (2010) suggested, action gestures (e.g., the motion of the stroke in tennis) can change not only the way listeners think but also the way gestures themselves express thinking, noting that gestures are not only reflections of one's verbalizations but can act as a bridge between action and thoughts. Interestingly, there is some evidence for a rational role of gestures. Cook and Tanenhaus (2009) showed that watching another person's gestures can have an impact on the watcher's subsequent performance. In education settings, Goldin-Meadow and Alibali (2013) suggested that it is clear that the gestures teachers produce can have a positive effect on students' learning. In sports there is limited research on the relationship between gestures and game outcome. However, there is a body of research which addresses, on a more global level, the effects of body language on performance. More specifically, Greenlees, Buscombe, Thelwell, Holder, and Rimmer (2005) examined the effects of opponents' clothing and body language (during warm up) on the way they are perceived in table tennis. Their results showed that viewing opponents displaying positive body language were perceived more positively than opponents displaying negative body language. In a more recent study, Furley, Dicks, and Memmert (2012) examined experimentally the effects of signaling dominance (e.g., confidence) and submissiveness (e.g., anxiety) on impression formation and outcome expectation during soccer penalty kicks. Their results indicated that penalty takers who displayed a dominant body language were perceived more positively by players and goalkeepers, than penalty takers who displayed a submissive body language. Moreover, regarding verbalizations, previous sociogenetic research proposed an internalization/externalization process in which influences and messages from the social context are internalized and interpreted by internal psychological mechanisms and in turn are externalized as self-talk (Lawrence & Valsiner, 2003). Since sport-related research on self-talk has revealed that behaviors of social agents within sport context such as coaches (e.g., Zourbanos, Hatzigeorgiadis, & Theodorakis, 2007) and significant others (e.g., Zourbanos, Theodorakis, & Hatzigeoriadis, 2006) have an impact on athletes' type of self-talk, we extended these findings further and hypothesized that other sources of social influence (such as overt athletes' verbalizations) within a competitive setting might influence opponents' verbalizations or even opponent game outcome. However, relatively little is known in sport literature about how verbalizations, gestures and game outcome interact and how this can have an impact on the watcher's subsequent performance.

Hardy, Oliver, and Tod (2009) in their conceptual model of self-talk in sport presented as potential antecedents of self-talk two general categories, namely situational and personal-level factors. In their model, the effects of situational factors on the content of self-talk have been focused on task difficulty, match circumstances, and the influence of coaches' behavior. Furthermore, Hardy et al. (2009) argued, that despite the increasing body of literature of the effects of self-talk on game outcome, research on the antecedents of self-talk is relatively sparse (e.g., Hardy, 2006).

In a series of studies, Van Raalte, Brewer, Rivera, and Petitpas (1994), Van Raalte, Cornelius, Brewer, & Hatten (2000) were the first to examine the effects of match circumstances in tennis as potential antecedents of self-talk. More specifically, Van Raalte et al. (1994) developed the Self-Talk and Gestures Rating Scale (STAGRS), an observational tool which assesses tennis players' use of observable verbalizations and gestures whilst simultaneously recording the score during a competitive match (in the sport literature the term self-talk has prevailed for the description of verbalizations addressed to the self; for review see Theodorakis, Hatzigeorgiadis, & Zourbanos, 2012). Although STAGRS was developed to operationalize self-talk, it captures the broader concept of verbalizations. Van Raalte et al. (1994) using the STAGRS reported that young tennis players' overt positive verbalizations were not related to better game outcome. However, negative