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Summary and Keywords

Self-talk has been studied from the earliest days of research in experimental psychology. In sport psychology, the cognitive revolution of the 1970s led researchers and practitioners to explore the ways in which self-talk affects performance. Recently, a clear definition of self-talk that distinguishes self-talk from related phenomena such as imagery and gestures and describes self-talk has emerged. Self-talk is defined as the expression of a syntactically recognizable internal position in which the sender of the message is also the intended received. Self-talk may be expressed internally or out loud and has expressive, interpretive, and self-regulatory functions. Various categories of self-talk such as self-talk valence, overtness, demands on working memory, and grammatical form have all been explored.

In the research literature, both instructional and motivational self-talk have been shown to enhance performance. Negative self-talk increases motivation and performance in some circumstances but is generally detrimental to sport performance. Matching self-talk to the task (e.g., using motivational self-talk for gross motor skills such as power lifting) can be a useful strategy, although findings have been inconsistent, perhaps because many individual sport performances involve diverse sport tasks that include both fine and gross motor skills. Research on athletes' spontaneous self-talk has lagged behind experimental research due in large part to measurement challenges. Self-talk tends to vary over the course of a contest, and it can be difficult for athletes to accurately recall. Questionnaires have allowed researchers to measure typical or "trait" self-talk. Moment-by-moment or "state" self-talk has been assessed by researchers observing sport competitions. Descriptive Experience Sampling has been used to study self-talk in golf, a sport that has regular breaks in the action. Some researchers have used fMRI and other brain assessment tools to examine brain function and self-talk, but current brain imaging technology does not lend itself to use in sport settings. The introduction of the sport-specific model of self-talk into the literature provides a foundation for ongoing exploration of spontaneous (System 1) self-talk and intentionally used (System 2) self-talk and highlights factors related to self-talk and performance such as individual differences (personal factors) and cultural influences (contextual factors).

Keywords: inner speech, self-communication, dual processing, sport psychology

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Despite the prominence of self-talk in the sport psychology literature, shared approaches to definition, theory, research, and measurement of self-talk have only begun to emerge over the past decade. Application of self-talk has been based heavily on intuitive ideas around the value of "positive" self-talk rather than on the most up-to-date research and theory. This article provides an overview of the history of self-talk in sport psychology and performance with a focus on self-talk definitions, theory, research, and measurement.

History of Self-Talk in Sport Psychology

Self-talk has been studied scientifically for almost as long as experimental psychology has been in existence, with researchers in the1880s taking an interest in understanding the nature and function of inner speech and the things people say to themselves (Reed, 1916). Vygotsky's (1986) cultural-historical psychology was one of the earliest theories in which inner speech/self-talk played a prominent role. He suggested that inner speech develops and becomes the medium of consciousness as children internalize culture and meaning in the form of language. Vygotsky asserted that the capacity for inner speech is necessary for purposeful and independent thinking and action (Yasnitsky, van der Veer, & Ferrari, 2014).

In the field of sport psychology, self-talk did not emerge as an area of research focus until the cognitive revolution of 1970s, when researchers began to consider ways in which the thinking of athletes influenced performance and experiences in sport (Williams & Straub, 2006). Early studies of self-talk in sport drew largely from the ideas of Albert Ellis's Rational Emotive Behavior Therapy (Ellis, 1957) and Aaron Beck's Cognitive Therapy (Beck, 1975), which highlighted self-talk as an important way to gain insight into faulty or irrational beliefs that influence emotion and behavior. Such theoretical

underpinnings are evident in sport psychology studies exploring how different types of self-talk affect performance (e.g., Hatzigeorgiadis, Zourbanos, Galanis, & Theodorakis, 2011; Tod, Hardy, & Oliver, 2011), in the area of self-efficacy where self-talk is seen as a way to understand and intervene with core beliefs about the self (e.g., Son, Jackson, Grove, & Feltz, 2011; Weinberg, Grove, & Jackson, 1992), and in studies comparing elite performers to other athletes in terms of self-talk (e.g., Mahoney & Avener, 1977).

In the 1970s self-talk also emerged as a key component of applied sport psychology practice as practitioners turned toward cognition and away from a primary focus on personality (Williams & Straub, 2006). Perhaps because of the conceptual ties between self-talk, core self-beliefs, and self-efficacy seen in the research literature, the applied literature on self-talk placed considerable emphasis on the importance of positive self-talk for sport performance. Interventions such as thought stopping, thought replacement, and self-talk journaling are examples of interventions designed for the purpose of enhancing performance by making an athlete's self-talk more positive (e.g., Ramirez & Beilock, 2011; Ziegler, 1987). Self-talk continues to be an important element of applied sport psychology included in psychology skills training (PST) programs and as part of the sport psychology canon (Andersen, 2009; Theodorakis, Hatzigeorgiadis, & Zourbanos, 2012).

Given the important place held by self-talk in the practice of applied sport psychology, it is not surprising that self-talk is a well-studied phenomenon. Despite the emergence of sound theories of self-talk in sport (e.g., Van Raalte, Vincent, & Brewer, 2016A) and a body of empirical work (Hatzigeorgiadis et al., 2011; Tod et al., 2011), there is popular enthusiasm for self-talk approaches that are not supported or have been minimally supported by scientific research. For example, there continues to be an emphasis on negative self-talk's harmful effects on sport performance despite limited research support for this idea (Tod et al., 2011). A shift to the use of theoretically and empirically grounded approaches to self-talk interventions is more likely to occur when practitioner-specific information tying self-talk theory to practice is available (Van Raalte, Vincent, & Brewer, 2016B).

Definition of Self-Talk

Having a clear and comprehensive definition of self-talk is crucial to both self-talk research and applied self-talk interventions, as the core understanding of what self-talk is serves as the basis of both measurement and theory. An ideal definition of self-talk is one that captures the nature of self-talk and provides a common understanding of the phenomenon that can guide researchers and practitioners in their work. Such a definition also allows for self-talk to be distinguished from other cognitive, behavioral, and communicative phenomena that overlap with, but are distinct from, self-talk. Although progress has been made in defining self-talk, many of the extant definitions conflate description, function, and categorization into multi-faceted definitions that are difficult for practitioners and researchers to apply (Theodorakis et al., 2012). For this reason, description, functions, and categorization of self-talk are presented in the following three sections.

Description of Self-Talk

A concise and clear descriptive definition of self-talk is particularly important because there is the potential for conceptual overlap between self-talk, and other cognitive phenomena such as thought and imagery, and behavioral phenomena such as gestures and non-verbal communication. In his review of self-talk definitions, Hardy (2006) pointed to definitions like “self-talk can be manifested as a word, a thought, a smile, or a frown” (Chroni, 1997) and “anytime you think about something you are in a sense talking to yourself” (Bunker, Williams, & Zinsser, 1993) as being too broad to provide clarity for researchers and practitioners. In order to narrow this definition Hardy highlighted three important features of self-talk that distinguish self-talk from other phenomena: (a) self-talk is directed toward the self and not toward others; (b) it can occur either out loud or internally; and (c) it occurs as a self-statement or something we say to ourselves. Thus, Hardy defined self-talk as “verbalizations or statements addressed to the self” and also included functions of self-talk in the definition, although Hardy noted that this definition might need future revision.

In an effort to clarify the definition of self-talk, Van Raalte and colleagues (2016A) put forth a definition that emphasizes the linguistic features of self-talk, defining the phenomenon as “the syntactically recognizable articulation of an internal position that can be expressed internally or out loud, where the sender of the message is also the intended receiver” (p. 141). The addition of the term “syntactically recognizable” separates self-talk from verbalizations such as shouts of frustration (aaahhhh!), self-statements made by gestures, and self-statements made outside of the context of formal language. Defining self-talk as an “articulation of an internal position” anchors the meaning of self-talk statements within the individual and places the origin of self-talk in consciousness and information processing.

Functions of Self-Talk

Whereas a descriptive definition of self-talk enables researchers and practitioners to distinguish between self-talk and other phenomena, defining the various functions of self-talk provides foundational information for researchers and can contribute to understanding of self-talk and the development of self-talk interventions. Expressive, interpretive, and self-regulatory functions of self-talk have been examined in the self-talk and sport literature (Hatzigeorgiadis, Zourbanos, Goltsios, & Theodorakis, 2008; Theodorakis, Hatzigeorgiadis, & Chroni, 2008).

With respect to the expressive function, Van Raalte and colleagues’ (2016A) definition highlights self-talk as an articulation of an internal position. Elaborating on this idea, they suggest that one of the functions of self-talk is to express intuitions, feelings, and other non-verbal thoughts (System 1) in a verbal, syntactically recognizable way. Thus, an athlete might say to herself, “I am so nervous right now.” This expressive feature is important because it allows for interpretation and consideration of current positions in relation to past experiences and other existing beliefs in consciousness. New experiences are understood in terms of past experiences and existing beliefs, and beliefs and convictions are adapted based on new experiences; this allows for self-regulation in the form of future planning (Larrain & Haye, 2012; Van Raalte et al., 2016A). Referring back to the previous example, once self-talk is expressed, the athlete may consider how to respond to her nervousness.

The self-regulatory function of self-talk has been the focus of much of the research in the self-talk literature. Self-talk is considered to be self-regulatory in that self-talk can be intentionally used to direct attentional focus, enhance confidence, serve to regulate effort, control emotional and cognitive

reactions, and facilitate automatic execution (Theodorakis et al., 2008). Such intentionally used (System 2) self-talk may also facilitate self-regulation via mental simulations and reflective processing which can lead to enhanced performance (Van Raalte et al., 2016A).

Self-talk is primarily considered in terms of its role in cognition and processing, however overt self-talk can also have an effect on the sport context (Van Raalte et al., 2016A). That is, although self-talk by definition is directed toward the self, when overheard by a competitor, fan, or other person, self-talk may influence perceptions and future interactions (Van Raalte, Brewer, Cornelius, & Petitpas, 2006). Thus, self-talk can alter the context even when it is self-directed.

Categorization of Self-Talk

A substantial amount of self-talk research has been dedicated to categorizing self-talk. Taxonomies are important in that they facilitate a complex and nuanced understanding of self-talk, which enhances the state of research and applied interventions. Some of the categories of self-talk that have been most widely studied and/or are most promising in the literature are discussed in this section. The taxonomies of self-talk presented are not orthogonal, and any particular self-talk may belong to more than one category and may serve more than one function.

Valence. Valence refers to the emotional tone of a self-talk statement. Researchers have separated self-talk into positive, negative, and neutral self-talk categories (Van Raalte, Brewer, Rivera, & Petitpas, 1994; Van Raalte et al., 1995, 2000). Positive self-talk refers to statements that are encouraging or self-assuring in tone, for instance, “Nice work!” or “Yes!” Motivational self-talk is often considered a subcategory of positive self-talk and refers specifically to self-talk phrases aimed at boosting motivation such as “go get ‘em!” or “you can do it!” Negative self-talk refers to statements that are discouraging or self-deprecating in tone, for instance, “I’m awful” or “Bad game.” Neutral self-talk has neither negative nor positive tone and may include self-talk statements related to tactics or strategy. Neutral self-talk also includes instructional self-talk, a category commonly seen in the literature that refers to statements such as “slow and steady” or “bend your knees,” which provide guidance or instruction to an athlete.

Overtness. Another approach to categorization of self-talk separates overt self-talk statements that occur out loud and can be seen or heard by others from covert statements that occur internally (Hardy, 2006). Self-talk may also be mouthed but not spoken aloud (Van Raalte et al., 2016A). Despite the obvious differences in observability between these types of self-talk, it is thought they serve similar self-regulatory functions and indeed research has shown that both overt and covert self-talk use similar brain structures (Morin, 2011; Unterrainer & Owen, 2006). Research aimed at understanding overtness in self-talk in sport settings has not been conducted, perhaps in part due to the challenges associated with measuring covert self-talk. Recent speculation about the power of overt self-talk for influencing the sport context, however, may provide an important avenue for further research in this area (Van Raalte et al., 2016A).

System 1 and System 2. Building on research and language from dual-processing theories (Kahneman, 2003; Evans & Stanovich, 2013), Van Raalte and colleagues (2016A) developed an approach that uses System 1 and System 2 categorizations to categorize self-talk based on features related to information processing. System 1, which involves rapid, autonomous processing, involves intuition, gut feelings, and impressions, and System 2, which is typically slower, involves cognitive effort and relies on working

memory. System 1 self-talk occurs in line with System 1 processes. That is the self-talk that reflects gut feelings and impressions such as shout of “hooray!” after a goal is scored or “no!” in the face of an error. System 2 self-talk involves the use of working memory and includes self-talk assigned in experimental self-talk studies, suggested by coaches, and selected by athletes for sport performance enhancement. That is the self-talk that directs attention in a particular way including “bend your knees and follow through” or “you can do it!”

Grammatical form. Although it has been used primarily in research conducted in non-sport contexts, grammatical form is another means of categorizing self-talk statements. Researchers have used this approach to categorization to compare the effects of interrogative statements such as “Will I?” to simple future statements such as “I Will” and have found performance benefits for the interrogative “Will I?” form (Puchalsak-Wasyl, 2014; Senay, Albarracin, & Noguchi, 2010). With regard to pronouns, the use of the collective pronoun “we” as in “we can do it,” relative to the use of the pronoun “I,” has been shown to enhance self-efficacy and performance on a sport task (Son et al., 2011). Similarly, the use of non-first person pronouns such as one’s own name enhances the ability to regulate thoughts, feelings, and behavior relative to the use of first person pronouns (Kross et al., 2014). Non-first person pronouns tend to be used when people actively and autonomously respond to negative situations (Zell, Warriner, & Albarracin, 2012). Additional research exploring the effects of self-talk of various grammatical forms in sport settings seems warranted.

Assigned and self-selected self-talk. A distinction between assigned/strategic self-talk statements and self-selected/automatic self-talk statements in experimental studies is another approach to categorization (Theodorakis et al., 2012). Assigned self-talk has been shown to enhance performance in experiments (Hatzigeorgiadis et al., 2011). In research settings, knowing which statements are assigned by researchers and which statements come from participants is important for understanding and contextualizing the findings of a study, as assigned self-talk helps ensure the equivalence of self-talk across conditions. When applying the distinction between assigned/strategic self-talk and self-selected/automatic self-talk categories outside of the research environment, however, the distinction becomes less clear. Using just two categories to identify the origin of self-talk appears to be insufficient because athletes may also pick up self-talk from teammates, the Internet, books, observing others being coached, in classes, and as part of and outside of conscious awareness. Some self-talk that athletes use, self-selected/automatic, may later be suggested by coaches or sport psychologists and thus be considered assigned/strategic. In such cases, self-talk could be simultaneously self-selected/automatic and assigned/strategic, adding confusion to the distinction between these self-talk types. Hardy (2006) described the self-determined nature of self-talk as falling on a continuum from assigned to freely chosen, which may be a helpful heuristic for understanding how self-talk is used in practice. Although the distinction between assigned/strategic and self-selected/automatic self-talk is important in research design, its value in applied settings is less clear.

Theoretical Approaches to Self-Talk in Sport Psychology

Whereas defining self-talk, functions of self-talk, and categories of self-talk can provide important information about what self-talk *is*, having theories of self-talk allows for an understanding of what self-talk *does* and for predictions and recommendations about what types of self-talk might be best for whom and under what circumstances. Several of the most prominent hypotheses and theories in the self-talk literature are discussed in the following sections.

Positive Self-Talk

One of the most prevalent hypotheses in the applied self-talk literature is that self-talk with a positive valence is best for sport performance (Tod et al., 2011). The underlying idea behind this hypothesis is that positive self-talk is linked to cognitive, motivational, behavioral, and affective mechanisms such that athletes who use positive self-talk are likely to decrease anxiety, improve concentration and focus, and perform better. Research testing the role of positive self-talk indicates that positive self-talk is effective in many circumstances but may not be ideal for everyone. Wood, Perunovic, and Lee (2009) found that participants with low self-esteem felt worse when using positive self-talk. Harvey, Van Raalte, and Brewer (2002) found that positive self-talk was correlated with worse golf putting accuracy. Van Raalte and colleagues (2000) studied competitive adult tennis players during tournament matches and found that only 1 player performed better after using positive self-talk, 2 players performed worse, and 15 players' point outcomes were unaffected by their self-talk. The general benefits of positive self-talk have been demonstrated, but further research is needed to help clarify under what circumstances and for whom positive self-talk is most effective.

The Matching Hypothesis

The matching hypothesis suggests that the greatest performance benefits will be derived from self-talk when the type of self-talk being used is appropriately paired with a particular type of performance task (Hatzigeorgiadis et al., 2011). Zourbanos, Hatzigeorgiadis, Bardas, and Theodorakis (2013) found that beginners performed better when using instructional self-talk for an accuracy task relative to motivational self-talk. Chang et al. (2014) found that for novices, instructional and motivational self-talk did not differ in their effects on throwing accuracy but motivational self-talk enhanced throwing for distance performance. Hardy, Begley, and Blanchfield (2015) found that instructional self-talk was more effective than motivational self-talk on an accuracy-based task only for skilled athletes. As skill level appears to play a role even when self-talk is matched to the task, and as many sport tasks are complex and cannot be separated neatly into complex or simple motor categories, selecting self-talk based solely on the basis of its match with a task may not be warranted (Tod et al., 2011). Further research on the self-talk matching hypothesis is needed before concrete self-talk prescriptions can be made.

Sport-Specific Model of Self-Talk

In the sport psychology literature, hypotheses and theories pertaining to self-talk have tended to focus on one prediction or research finding at a time, for example, the positive self-talk hypothesis. In an attempt to formalize the body of literature into a larger theoretical frame, Hardy (2006) highlighted the importance of considering the relationships among multiple factors including the antecedents of self-talk, self-talk itself, and consequents of self-talk. He also noted that relationships among factors affecting self-talk were likely circular, reciprocal, and interrelated in nature.

Van Raalte and colleagues (2016A) built upon Hardy's foundations by considering broad questions such as "If we already know everything that we know, then why do we talk to ourselves?" and "When we talk to ourselves, who is talking to whom?" Their sport-specific model of self-talk can be used to provide answers to such questions. Further, their model highlights how dual processing theories can be used to explain the separate but interacting systems by which information from the outside world is processed (see above). The model also describes the reciprocal relationships among personal factors such as individual personality characteristics, contextual factors such as the sport being played, the level of competition, the team and broader culture, behavior (e.g., performance), and self-talk itself. The sport-specific model of self-talk is useful in providing a lens through which the body of self-talk literature in sport can be interpreted and also in suggesting new areas of research. Three specific theories that follow from the sport-specific model are discussed in the following sections.

Exhaustion of System 2. One idea central to the sport-specific model of self-talk is that System 2 self-talk is consciously monitored and requires cognitive energy. Thus, extensive use of System 2 self-talk has the potential to drain cognitive resources, which can lead to performance decrements (Van Raalte et al., 2016A). This idea is supported by sport psychology literature related to "paralysis by analysis" and re-investment theory, which suggest that overreliance on conscious processing of information (i.e., reinvestment) is related to choking under pressure (Iwatsuki, Van Raalte, Brewer, Petitpas, & Takahashi, 2016), and by the psychology literature, which shows that self-control such as that required by System 2 self-talk causes ego-depletion and poor self-control task performance (Hagger, Wood, Stiff, & Chatzisarantis, 2010). These findings may serve as impetus for future investigations specific to self-talk and sport performance.

Self-Talk Dissonance. Another hypothesis that follows from the sport-specific model of self-talk is the self-talk dissonance hypothesis, which predicts that System 2 self-talk that conflicts with System 1 gut feelings and impressions is likely to deplete cognitive resources and have a detrimental effect on performance. For example, individuals with low self-esteem (System 1) who are asked to use System 2 self-talk such as "I am the best" that conflicts with their "I am not good enough" self-perceptions are likely to experience self-talk dissonance. Wood et al. (2009) found evidence in support of this hypothesis. In their research, individuals with high self-esteem benefited from the use of positive self-talk, whereas individuals with low self-esteem who used positive self-talk reported feeling worse. Other research has shown that attempting to use conscious monitoring with messages that conflict with physiological/emotional state can be detrimental to performance when compared with the use of self-talk that matches the state. For instance, people who are anxious and use the self-talk "I am calm" perform worse than those who are anxious and use the self-talk "I'm excited" (Brooks, 2014). Further research examining the self-talk dissonance hypothesis may help identify additional mediators and moderators of the self-talk–performance relationship.

Self-Talk and Culture. The sport-specific model of self-talk highlights the important role that context and culture play in understanding self-talk and self-talk behavior. Hardy, Roberts, and Hardy (2009) noted that self-talk can be learned from teammates, opponents, parents, or even media portrayals of athletes. Such findings have implications for the culture within teams but also in relation to culture more broadly understood. With respect to team culture, research has demonstrated that common acceptance of self-talk use as a performance strategy within a team leads to greater use of self-talk (Hardy & Hall, 2006)

and that coach behaviors influence the types of self-talk used by their athletes (Conroy & Coatsworth, 2007; Theodorakis et al., 2012).

With respect to culture more broadly understood, the use and effect of self-talk varies across cultural groups and with the language spoken. For example, Peters and Williams (2006) found that the self-talk of East Asian students was proportionally more negative than that of European American students on a dart-throwing task and that negative self-talk was associated with better performance for East Asians than for European Americans. When looking at the self-talk of athletes across cultures, it is important to recognize that individual languages contain unique words that have no equivalent in English, such as the Finnish word *sisu*, meaning the psychological strength used to overcome extraordinary challenges (Anthes, 2016). Exploring the self-talk of athletes with regard to culture and language opens up an array of interesting research questions such as the effects of unique self-talk vocabulary and the self-talk and experiences of multilingual athletes.

Finally, if Vygotsky's theories about the internalization of culture as inner speech are taken into account, gaining insight into how context influences the structure, use, and meaning of self-talk are importantly linked with both team climate and culture more broadly defined. It seems possible that self-talk may provide a way to look at multiculturalism in sport and may also play a prominent role in linking existing knowledge in sport psychology to findings related to culture.

Research and Measurement in Self-Talk

Much research on self-talk in sport has an applied focus. That is, research has been designed to answer such questions as "What is the effect of self-talk on sport performance?" and "What is the best self-talk for athletes to use?" The questions that researchers can ask and answer are intimately related to their ability to measure constructs of interest. In this section we describe major approaches to self-talk research and measurement.

Exploratory Studies

Early research related to self-talk in sport was based on the premise that understanding elite athletes and their psychological skills could inform best practices for all athletes. Therefore, research was conducted to explore the psychological approaches used by elite athletes and to compare the approaches of elite and other athletes (Gould, Eklund, & Jackson, 1993; Mahoney & Avener, 1977). With regard to self-talk, such research typically involved questionnaires that included items designed to determine how much self-talk was used and how effective the self-talk was perceived to be as an intervention strategy. Measures that assess self-talk focusing on the level of use include the Psychological Skills Inventory for Sports (PSIS; Mahoney, Gabriel, & Perkins, 1987), the Athletic Coping Skills Inventory-28 (ACSI-28; Smith, Schutz, Smoll, & Ptacek, 1995), the Test of Performance Strategies (TOPS; Thomas, Murphy, & Hardy, 1999, revised by Hardy, Roberts, Thomas, & Murphy, 2010), and the Athletes' Positive and Negative Self-Talk Scale (Zourbanos, Hatzigeorgiadis, & Theodorakis, 2007). More recently, researchers have expanded their exploration of self-talk by focusing on measuring the functions of self-talk via such questionnaires as the Functions of Self-Talk Questionnaire (Theodorakis et al., 2008) and the Self-Talk Questionnaire for Sports (Zervas, Stavrou, & Psychountaki, 2007) and

assessing athletes' spontaneous self-talk via the Automatic Self-Talk Questionnaire for Sports (Zourbanos, Hatzigeorgiadis, Chroni, Theodorakis, & Papaioannou, 2009) and the Thought Occurrence Questionnaire for Sport (Hatzigeorgiadis & Biddle, 2000). These measures address a broader range of self-talk than earlier questionnaires but do not include sport-specific self-talk such as the mantras and dissociative self-talk reported by marathon runners (Van Raalte, Brennan Morrey, Cornelius, & Brewer, 2015).

Assessing the self-talk of elite and other athletes via questionnaire is a convenient approach that allows for comparisons across athlete groups but also has important limitations. Self-talk questionnaires typically require athletes to rate their self-talk use on scales ranging from not at all, never, or rarely to very much, always, very often. Because self-talk ratings are not tied to real metrics, one athlete's rating of "rarely" could be similar in objective frequency of self-talk use to another athlete's rating of "often." Therefore, meaningful comparisons across individual athletes in terms of responses on these types of self-talk questionnaires cannot be made. Further, the questionnaire approach relies on athletes' ability to accurately recall their past self-talk. Retrospective reports of mental processes, including self-talk, are notoriously unreliable, subject to the limitations of retrospective introspection (Brewer, Van Raalte, Linder, & Van Raalte, 1991; Hurlburt & Heavey, 2006). Thus, it is difficult to determine if the self-report measured by questionnaires is a valid reflection of athletes' actual experiences as some self-talk scales are uncorrelated with open-ended self-reports of inner speech and there are only weak correlations among various self-talk measures and their subscales (Uttl, Morin, & Hamper, 2011). These findings are concerning because self-talk questionnaires should all measure the same construct—self-talk. Additional attention to measurement of self-talk will enhance understanding in this area.

Self-Talk in Situ

Observational studies of self-talk allow researchers to collect real-time data on the self-talk and performance of competitive athletes. For example, Van Raalte et al. (1994, 2000) observed self-talk and tennis tournament outcomes on a point-by-point basis. They found that negative self-talk was widely used by athletes during competition and also noted that negative self-talk was related to worse tennis performance among youth athletes. Further, they found individual differences in self-talk use. Some athletes benefited from negative self-talk, perhaps because the self-talk served a motivational function. Observational studies of self-talk in real sport environments have good external validity, allowing for real-time assessment of actual self-talk and examination of the relationship between self-talk and performance. Observational studies do not allow for the assessment of athletes' internal self-talk during play, however.

Strategies designed to assess self-talk in situ include: (a) videotaping behavior and reviewing the video with the performer to reconstruct self-talk used during the performance; (b) asking performers to use imagery to recall their self-talk used during performance; (c) interviewing participants about their self-talk during performance; (d) having athletes speak their self-talk aloud while performing; (e) asking performers to write their self-talk via thought listing and sentence completion techniques; and (f) using a combination of these and related procedures (DeSouza, DaSilveira, & Gomes, 2008; Guerrero, 2005; Miles & Neil, 2013; Peters & Williams, 2006; Rogelberg et al., 2013; Van Raalte et al., 1994; Van Raalte, Cornelius, Copeskey, & Brewer, 2014). The awkwardness of writing or speaking private thoughts aloud, along with the actor-observer bias and the social desirability concerns that arise when writing or

speaking self-talk aloud in the presence of others, make it likely that the self-talk identified via these methods does not fully reflect the self-talk as experienced by participants.

Many of the shortcomings of these approaches have been addressed by descriptive experience sampling (DES; Hurlburt & Heavey, 2006, 2015; Hurlburt, Heavey, & Kelsey, 2013). DES is a method designed to enable people to capture their pristine inner experiences including their ongoing thoughts, feelings, and self-talk. To accomplish this goal, participants carry a beeper, and when a random beep is emitted, they immediately record the experiences salient to them immediately prior to the beep. Within 24 hours of the beep, participants are interviewed about their experiences to help provide a full description of beeped experiences. Efforts are made to reduce the effects of presuppositions of participant experiences. That is, DES uses questions are both open-ended and "open-beginninged," allowing participants to freely describe what, if anything, was their experience just prior to the moment of the beep. The procedure is conducted over several days to enable participants and researchers to improve their experience-apprehension skill so that the actual form and content of participants' recorded inner experience is a true reflection of their inner experience, which can then be categorized and/or described via narrative description. DES is a measurement approach that can identify self-talk and patterns of self-talk in real time and facilitate examination of self-talk that is unique to individuals and contexts such as that of competitive golfers (Dickens, 2007). Combining DES and/or elicitation interviews with assessment of neuronal brain changes via technology such as Brain TV may allow for the assessment of self-talk at the experiential and neuronal levels (Petitmengin & Lachaux, 2013). DES may also be used to validate extant self-talk questionnaires, which have adequate reliability but have not yet demonstrated validity in sport settings.

Experimental Studies

Perhaps to minimize the difficulties associated with measuring self-talk in situ, the majority of research on self-talk in sport settings or using sport tasks has focused on experimental studies. Such studies typically assign self-talk and focus on the measurement of performance and related variables. A body of literature has shown that athletes who use self-talk as part of a psychological skills training package experience performance benefits (Theodorakis et al., 2012). Although such studies highlight the benefit of self-talk, research designs that include self-talk as part of a psychological skills intervention make it difficult to determine the unique effects of self-talk on sport performance.

Research exploring the specific effects of self-talk on athletes' and students' performance on sport and sport-like tasks has also been conducted. Self-talk use has been shown to have a beneficial effect on the learning of sport skills, the performance of sport accuracy tasks, the performance of tasks that involve strength and power, and on endurance sports (Masciana, Van Raalte, Brewer, Branton, & Coughlin, 2001; McCormick, Meijen, & Marcora, 2015; Takahashi & Van Raalte, 2010; Theodorakis et al., 2012). A meta-analysis of research on instructional and motivational self-talk indicates such self-talk has a moderate beneficial effect on sport task performance (Hatzigeorgiadis et al., 2011). Similar benefits of positive, motivational, and instructional self-talk were found by a systematic review of the self-talk literature (Tod et al., 2011), although results indicated no significant relationship between negative self-talk and sport performance. Overall, the beneficial effects of self-talk were found to be most likely to accrue when participants were performing novel tasks and tasks that involve fine motor skills. Practicing self-talk enhances its beneficial effects, perhaps allowing self-talk to become an

integral part of the sport performance experience. To facilitate comfort and familiarity with self-talk and perhaps minimize the need for extensive self-talk practice, some researchers have had participants self-select their own self-talk statements (Harvey et al., 2002). To fully understand the effects of self-talk on sport performance, more research exploring the self-talk of competitive athletes and their performance in actual competitive sport environments is needed.

Measuring Brain Activity

Research exploring neurological aspects of self-talk has shown that some participants (17%) who are at rest while undergoing functional magnetic resonance imaging (fMRI) report that self-talk is their dominant mental activity (Delamillieure et al., 2010). This type of self-talk, self-talk that occurs spontaneously, has different neural correlates than that of assigned inner speaking (Hurlburt, Alderson-Day, Kuhn, & Fernyhough, 2016). Specific areas of the brain have been found to be involved in planned, directed, self-talk (Christoff, 2012; Longe et al., 2010; Morin, 2011) as well as automatic self-talk (Kühn et al., 2013). Although neurological approaches to measuring self-talk are promising, extant tools do not easily lend themselves to assessing self-talk during many sport performance tasks.

Future Directions

Considering its long history as an important part of sport psychology research and practice, it is likely that self-talk will continue to be prominent in the sport psychology literature. Indeed, recent advances in the definition, theory, and measurement of self-talk present the possibility that self-talk could play an important role in moving the sport psychology literature forward.

In the area of definition, movement toward a commonly accepted understanding of what self-talk is and what it is not will streamline the research literature and open new doors in the areas of self-talk theory and measurement. Specifically, a strong definition of self-talk will allow more clarity with respect to where phenomena such as mantras, internal music, prayer, and talk aimed at inanimate objects (i.e., “get in the net!”) fall in relation to self-talk. As increased attention is paid to self-talk definitions, it is likely that self-talk measurement will be reconsidered as well. Already, promising approaches to measurement are emerging such as DES and neural analysis that will allow researchers to observe self-talk in new ways, thereby allowing them to ask and answer new self-talk related questions.

The sport-specific model of self-talk (Van Raalte et al., 2016a) offers a range of self-talk hypotheses that may be tested over the coming years by providing a conceptual schema for understanding how personal factors, behavior, and context interact with self-talk. Further, the categorization of self-talk as it relates to System 1 and System 2 may provide further insight into existing sport psychology phenomena such as paralysis by analysis and choking and direct attention to little-studied areas related to individual differences and cultural and contextual factors. Thus, progress with regard to definition, measurement, and theory will provide the foundation for future developments in the field.

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