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Effects of Self-Talk: A Systematic Review

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This article presents a systematic review of the literature examining the relationship between self-talk and performance. “Second-generation questions” regarding potential mediators and moderators of the self-talk–performance relationship were also examined. A total of 47 studies were analyzed. Results indicated beneficial effects of positive, instructional, and motivational self-talk for performance. Somewhat surprisingly, two evidence-based challenges to popular current viewpoints on self-talk emerged. First, negative self-talk did not impede performance. Second, there was inconsistent evidence for the differential effects of instructional and motivational self-talk based on task characteristics. Results from the mediation-based analysis indicate that cognitive and behavioral factors had the most consistent relationships with self-talk. The findings are discussed in the context of recent theoretical advances, and the article includes recommendations for future research (e.g., the use of designs allowing the testing of meditational hypotheses) and for current applied practice (e.g., avoiding the use of thought-stopping techniques).

Keywords: psychological skills training, mental preparation, applied sport psychology

Athletes and coaches believe that self-talk is an intervention that enhances sporting performance and various psychological states, such as confidence (Vargas-Tonsing, Myers, & Feltz, 2004; Wang, Huddleston, & Peng, 2003). In addition, many sport psychologists promulgate the benefits athletes and coaches can expect from using self-talk interventions. There is disagreement, however, among sport psychology researchers regarding the data on which to advise sport participants. For example, some investigators argue there is limited evidence that self-talk enhances competitive sporting performance (Gardner & Moore, 2006; Martin, Vause, & Schwartzman, 2005). One historical reason for the lack of evidence is that self-talk has not been subject to extensive empirical examination. The situation has evolved somewhat in the last 15 years, and researchers have expended considerable effort investigating the self-talk and performance relationship. It has only been recently that sufficient research has accumulated to allow investigators to review the empirical literature regarding self-talk (e.g., J. Hardy, 2006).

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The present review is timely and contributes to knowledge for at least three reasons. First, a number of studies have appeared since the first peer-reviewed synthesis of the self-talk literature (J. Hardy, 2006), and an analysis of these investigations can allow reviewers to make more meaningful knowledge contributions, particularly within a relatively underdeveloped aspect of sports psychology. Second, the previously published self-talk literature review did not critically examine the self-talk and performance relationship, but focused on conceptual issues pertaining to self-talk (J. Hardy, 2006). Third, to date, both peer-reviewed and non-peer-reviewed self-talk reviews and coaching articles have focused primarily on what might be termed “first-generation questions” (cf. Higgins, 1999, p. 1313) or the effect self-talk interventions have on performance. Reviewers have seldom sought answers to “second-generation questions”: the examination of the mediators underlying (i.e., how does self-talk influence performance?) or moderators influencing (i.e., which type of self-talk is most effective?) the effect of self-talk on performance. Such a focus would have both theoretical and applied value, providing athletes and coaches with advice on optimizing their use of self-talk. Consequently, a summary of the available literature examining the self-talk–performance relationship that also generates initial mediator- and moderator-related information ought to stimulate future investigations with strong theoretical and applied implications.

Having identified the ways that an evaluation of the literature might contribute to knowledge, a relevant issue is the determination of a suitable review methodology. To date, only narrative self-talk reviews have been published. With such approaches, clear inclusion and exclusion criteria are not always present, and in addition, the possibility of reviewer bias is increased. One way to minimize bias is to adopt systematic and more objective ways of reviewing literature. As a further advantage, systematic and objective approaches can allow authors to answer more complex and theory-driven questions beyond those focused on self-talk’s influence on motor skill execution. Among the methods available, the systematic review and the meta-analysis are the two most common approaches. The systematic review is a methodology wherein investigators collate studies that fit specific eligibility criteria to answer research questions. Authors use transparent systematic methods to minimize bias and provide more reliable findings compared with narrative approaches. Key characteristics include (a) clearly stated objectives with defined eligibility criteria, (b) transparent replicable methodology, (c) systematic attempts to identify studies meeting the eligibility criteria, (d) assessment of research, and (e) systematic presentation and synthesis of the findings (Higgins & Green, 2009). In addition to these characteristics, a meta-analytic approach utilizes a definitive methodology, in which previous studies’ findings are converted to a standard metric (i.e., effect size) that permits the use of statistical tests to analyze results (Thomas, Nelson, & Silverman, 2005).

Although a meta-analysis may generate very precise information regarding effects, this technique is not suitable for all study designs and literatures. For example, within the self-talk literature, single-subject designs have been popular. Their reliance, however, on qualitative interpretation negates the generation of an effect size, thus preventing their inclusion in a meta-analysis. An additional pertinent feature of the present self-talk empirical literature is its relative underdevelopment. From a meta-analytic perspective, the use of a small number of studies can have adverse effects on statistical power (Shadish & Sweeney, 1991). Given the

pertinence of second-generation research questions to the present investigation, which have received limited attention from self-talk researchers, such a situation was likely to be compounded. Consequently, a systematic review was adopted as the methodology of choice.

One criticism of first generation-oriented research is that results indicate little about when, where, why, and how interventions may work (Shadish & Sweeney, 1991). These questions pertain to the role of mediating variables, which might help explain the effect of self-talk on performance-related outcomes, as well as moderating variables, which might identify constraints as to when those effects will hold. Previous researchers (e.g., J. Hardy, Oliver, & Tod, 2009) have argued that to determine meaningfully whether self-talk affects performance it is necessary to consider a number of moderating factors. For example, it may be that certain types of self-talk are effective and others are not, or that self-talk works for some types of athletes and not others.

Potential Moderators of the Relationship Between Self-Talk and Performance

In the present review, we examined the evidence concerning two variables, athlete skill level and self-talk type, with the potential to moderate the self-talk–performance relationship. Moderators influence relationships (in the present case, the self-talk–performance relationship) by altering the direction (e.g., positive or negative effect) and/or by varying the magnitude/strength. This may then affect the consistency/robustness of this relationship within the sampled literature. Although it is important to note that we are not directly testing whether a moderating effect exists, examining the overall direction and consistency of findings for different categories or levels of potential moderators generates meaningful albeit initial information concerning the presence of a moderating effect.

Athlete level and skill type were selected as moderators because there was descriptive evidence suggesting they may influence self-talk intervention effectiveness as far as performance is concerned (e.g., Mahoney & Avener, 1977). Moreover, it was possible to formulate theoretically grounded rationale for their potential moderating role. For instance, descriptive studies have highlighted differences in the use of self-talk between elite and nonelite, and between successful and unsuccessful athletes (e.g., Highlen & Bennett, 1983), and it has been theorized that during early stages of learning, novices use more explicit instruction and talk themselves through the phases of a movement (Fitts & Posner, 1967). During later stages of learning, individuals engage in less cognitive activity and their performances are more automatic. As such, although the moderating role of skill level has not been empirically assessed, novice athletes may benefit more frequently from the use of self-talk as compared with their skilled counterparts.

There is also a growing body of research indicating that the type of self-talk used is important in terms of performance outcomes. By and large researchers have conceptualized self-talk as either positive or negative, or instructional or motivational in nature. Positive self-talk has predominantly been hypothesized to aid performance whereas negative self-talk has been expected to cause detrimental performance effects (Zinsser et al., 2010). From another perspective, Theodorakis,

Weinberg, Natsis, Douma, and Kazakas (2000) argued that the effects of self-talk, either instructional or motivational, on performance might depend on the type of task being performed. As the execution of precision-based tasks can be aided through increased attentional focus on relevant technical components, instructional self-talk, which focuses on technical, tactical, and/or kinesthetic aspects of movements, is hypothesized to be more effective than motivational self-talk for the execution of such tasks. In contrast, motivational self-talk is predicted to be more effective than its instructional counterpart for the execution of condition-related tasks characterized by strength and endurance, as motivational self-talk is used to increase effort, enhance self-confidence, and/or create positive moods. Theodorakis et al. (2000) reported some support for their task-matching hypothesis, and results from some subsequent studies have provided additional support for their original predictions (e.g., water polo; Hatzigeorgiadis et al., 2004).

Potential Mediators of the Relationship Between Self-Talk and Performance

In addition to examining the research regarding self-talk and performance, and the conditions that might influence the consistency and direction of any effect, this review also considered potential mechanisms that might explain the relationship. J. Hardy and colleagues' (2009) recently proposed conceptual framework included factors they theorized to underpin the self-talk–performance relationship. Adopting a throughput perspective, the authors argued that self-talk improves motor skill execution via four possible (cognitive, motivational, behavioral, and affective) mechanisms. The authors stated that more research was required to develop a current understanding of the identified mechanisms' salience. This was primarily due to the lack of explicit testing of mediation within the empirical self-talk literature. By collating the existing findings where the conceptualized mechanisms have been examined as dependent not mediating variables, the current study represents an initial step toward examining the credibility of J. Hardy and colleagues' conceptual postulates. The rationale behind these researchers' proposed mediators is briefly considered next.

J. Hardy and colleagues (2009) used the term *cognitive mechanisms* to encompass informational processing and attentional control. Athletes have reported using self-talk for a variety of attention-based outcomes (e.g., concentration; Chroni, Perkos, & Theodorakis, 2007), and in addition, experimental studies have indicated that manipulating self-talk may be a useful adjunct strategy to alter attentional foci (Bell & Hardy, 2009) and decrease interfering thoughts (Hatzigeorgiadis et al., 2004). Attention appears to be a potential mediatory mechanism worthy of closer examination given its strong theoretical and empirical links with performance (Wulf & Prinz, 2001).

The second self-talk–performance relationship mediator that J. Hardy and colleagues (2009) proposed represents a motivational theme, with a focus on self-efficacy (Bandura, 1997) and persistence or long-term goal commitment. Although self-talk has been conceptualized as an antecedent of self-efficacy, empirical findings regarding the effects of self-talk on self-efficacy are equivocal (Landin & Hebert, 1999; Scopp, 2003), which might threaten conclusions regarding self-efficacy's

mediatory role. Self-talk use has also been associated with persistence and subsequent performance on a challenging task (Chiu & Alexander, 2000).

Third, J. Hardy and colleagues (2009) suggested behavior as a class of self-talk–performance mechanisms. Researchers have identified improvements in both subjectively and objectively assessed technique resulting from self-talk (Anderson, Vogel, & Albrecht, 1999; Edwards, Tod, & McGuigan, 2008). Furthermore, it has been proposed that during early phases of skill learning, novices may “talk” themselves through movements (Coker & Fischman, 2010; Fitts & Posner, 1967). It is possible that changes in movement patterns or technical execution underlie any performance improvements as a result of using self-talk.

Lastly, J. Hardy and colleagues (2009) proposed affect as a potential mediator category. There is a great deal of psychological literature linking cognitive content and affect (e.g., Beck, 1976; Lazarus, 1991), and in turn, affect and performance (e.g., Beedie, Terry, & Lane, 2000). The contention that affective variables may mediate the self-talk–performance relationship is not new (L. Hardy, Jones, & Gould, 1996), and findings from intervention studies offer support that self-talk may influence anxiety in a sporting context (e.g., Maynard, Warwick-Evans, & Smith, 1995). The explicit mediating roles of affect, anxiety, or mood, however, have yet to be examined. A summation of the self-talk–affective states literature was considered an important initial step toward this goal.

In sum, the purpose of the current study was to review the sports-oriented experimental self-talk literature employing a transparent systematic approach. The first specific aim was to review the evidence concerning whether self-talk influences sporting performance. The second specific aim was to review the evidence regarding four types of mediators: cognitive, motivational, behavioral, and affectual. The third specific aim was to review the evidence regarding two proposed moderators: athlete skill level and self-talk type. Ultimately, the examination of this literature might allow sport psychologists to advance their knowledge toward addressing one of the most commonly cited queries in therapy-based research: “*What treatment, by whom, is most effective for this individual with that specific problem, and under which set of circumstances?*” (Paul, 1967, p. 111).

Method

Search Strategy

To obtain articles of interest, a comprehensive search of three sources was conducted: (a) online search of electronic databases such as, SPORTDiscus, PsycINFO, PsycARTICLES, PubMed, Google Scholar, and Web of Science; (b) manual review of reference lists within retrieved articles; and (c) manual search of journals, including *International Journal of Sport Psychology*, *International Journal of Sport and Exercise Psychology*, *Journal of Applied Sport Psychology*, *Journal of Sport Behavior*, *Journal of Sport & Exercise Psychology*, *Journal of Sports Sciences*, *Psychology of Sport and Exercise*, *Research Quarterly for Exercise and Sport*, and *The Sport Psychologist*. Key phrases employed included *self-talk*, *self-statements*, *self-verbalizations*, *mental skills*, *psychological skills*, *psychological skills training*, *performance*, *athlete*, *sport*, *exercise*, and *physical activity*. Only English language articles that contained data relevant to self-talk and sport-related activities were

included in the present review. Studies that examined the effects of self-talk in combination with other mental skills (e.g., goal setting) and citations that were abstracts were excluded from our review. Furthermore, papers were excluded if the type of self-talk or procedure used was unclear.

Procedure

Retrieved papers were scrutinized using the aforementioned inclusion and exclusion criteria. Once these criteria had been satisfied, we used procedures similar to those that Sallis, Prochaska, and Taylor (2000) used to analyze the papers' content in a descriptive and semiquantitative review. Each study was listed alphabetically according to author; however, as independent effects (k) were employed as the unit of analysis, coding also reflected papers that reported multiple studies and/or effects on multiple dependent variables (e.g., Theodorakis et al., 2000, Study 1; Theodorakis et al., 2000, Study 2). All papers meeting the stated criteria are indicated in the reference list with an asterisk (*). Data tables were developed to reflect sample characteristics (e.g., sex, age, competitive level), research designs (e.g., presence of manipulation check, random allocation, random selection), and the effects of self-talk.

Analysis

The data tables mentioned above were analyzed to create summary tables presented in the results section, which involved a number of stages. First, sample and design characteristics were summarized by a tally count. Second, the effects of self-talk on performance were examined. In a fashion similar to that of Goodger, Gorely, Lavalley, and Harwood (2007), for a potential effect of self-talk to be examined, a k of at least 3 was required to have the variable included as an outcome measure. When there were an insufficient number of comparisons, theoretically meaningful and conceptually similar variables were combined together (e.g., cognitive mediation mechanism). Consistent with other semiquantitative reviews, the direction of each effect was subsequently coded as positive (+), negative (-), no effect (0), or indeterminant/inconsistent (?) if the effect was ambiguous. To more comprehensively represent the data, a narrative commentary accompanied each effect. The summarizing of the research surrounding each consequence was performed by the calculation of the percentage of support offered by the relevant studies. We employed Sallis et al.'s (2000) coding system: 0–33% = no effect, 34–59% = inconsistent or indeterminate effect, 60–100% = positive or negative effect. Third, potential mediator- and moderator-related research findings were examined using the same classification system described here.

Three researchers familiar with the field of self-talk and with experience at employing a variety of quantitative analysis techniques coded the data. Through discussion, a consensus and final coding of the data were agreed between all three researchers. This allowed the researchers to form an in-depth appreciation of the searched literature and ensure that only valid studies were included in the final analysis stage. As a result of this procedure, a limited number of initially retrieved papers were subsequently excluded from the study (see below for a more complete description).

Results

General Findings

Following the aforementioned search strategy, a number of studies were initially identified as being potentially relevant for the review. Upon closer inspection of the reported interventions, however, a variety of concerns emerged regarding their suitability. For example, a common reason for a study's exclusion was the incorporation of supplementary intervention components, such as educational lectures (e.g., Howard & Reardon, 1986) or additional mental skills (Tenenbaum et al., 1995). Another two studies met the inclusion criteria, but either did not employ a design capable of generating salient data to address the present research questions (Tynes & McFatter, 1987) or the manipulation check indicated that self-talk groups were not established (J. Hardy, Hall, Gibbs, & Greenslade, 2005). Descriptive (sample and design) data from these studies were included in the review, but excluded from the main performance-oriented analysis. Consequently, a total of 47 studies were identified. The number of *ks* throughout the results varies depending on the specific question being answered and is reported.

Descriptive Characteristics of Self-Talk Studies

The analysis of the literature allowed a clear picture of the types of samples and designs that self-talk researchers have employed. As a result, we were able to highlight gaps in these descriptive aspects. The present review was based on a total population size of 2,113 participants (1,146 male, 715 female, and 252 not specified) with an average sample size of 44 ($SD = 39$). Inspection of Table 1 reveals that half of the studies employed samples that comprised both males and females, with a little less than half (46%) of the eligible studies reporting a mean age of 20–39 years. The average age, based on the studies that reported a mean age, and weighted to account for sample size, was 19.16 ($SD = 4.88$). No investigations were based on data collected from masters or older athletes. Students, as opposed to competitive athletes, were recruited most frequently (41%). Despite self-talk's applied relevance, slightly less than one quarter of the studies were based on findings employing talented or elite-level athletes (e.g., national developmental squads; 22%).

As seen in Table 2, the vast majority of the research occurred within laboratory or noncompetitive settings (91%) using mixed model (54%), within-participant (24%), or single-subject experimental designs (9%). The majority of studies (56%) had used either random or matched allocation strategies. Allocation strategies were not relevant for one third of the studies (31%) owing to their within-participant designs, and of these, nearly all (92%) used a full or partial counterbalancing strategy. Other notable design features were that the majority of studies (63%) made use of a manipulation check or an overt self-talk manipulation strategy (22%), with just over half (52%) of the studies incorporating a self-talk practice/familiarization phase. A range of control conditions were represented within the literature: (a) no instruction (37%), (b) "do your best" (11%), (c) placebo (9%), (d) distraction/neutral (7%), or (e) another type of psychological intervention (13%). A control condition was not described in 2% of the non-single-subject studies with no control

Table 1 Self-Talk Research Sample Characteristics

Characteristic	Studies, <i>N</i> (%)
Sample Size	
<20	8 (17)
20–39	12 (26)
40–59	12 (26)
60–79	12 (26)
80–99	1 (2)
100+	2 (4)
Gender	
Male only	12 (26)
Female only	6 (13)
Combined	24 (51)
Not stated	5 (11)
Mean Age	
<20	18 (38)
20–39	21 (45)
Not stated	6 (13)
Range given	2 (4)
Competitive Level	
Student	20 (43)
Novice	5 (11)
Competitive	6 (13)
Talented/Elite	10 (21)
Youth	5 (11)
Injured	1 (2)
Total <i>N</i> =	47 (100)

group. Regarding type of self-talk intervention, the majority of research (67%) has focused on the effects of instructional self-talk and 41% of the studies had compared different self-talk interventions, with the most common comparisons involving instructional versus motivational self-talk, and positive versus negative self-talk.

Effects of Self-Talk on Performance

As previously stated, researchers have conceptualized self-talk in two different manners. Traditionally, there has been emphasis on positive and negative self-talk; however, a slightly more contemporary conceptualization has been instructional

Table 2 Self-Talk Research Design Characteristics

Characteristic	Studies, N (%)	Characteristic	Studies, N (%)
Type of Self-Talk*			
Instructional	32 (68)	Self-Talk Practice/Familiarity	
Motivational	16 (34)	Practice/familiarity	24 (51)
Positive	13 (28)	No practice	23 (49)
Negative	3 (6)	Manipulation Check*	
Other/Ambiguous	8 (17)	Present	30 (64)
		Overt self-talk	10 (21)
		Not stated	9 (19)
Context			
Precompetition and competition	3 (6)	Counterbalancing	
Practice/training/field test	32 (68)	Present	6 (13)
Laboratory	11 (23)	Partial	4 (9)
Ambiguous	1 (2)	Not used	1 (2)
		Not applicable	36 (77)
Design Setup			
Between-posttest only	5 (11)	Control Condition*	
Mixed model	26 (55)	Baseline/pretest	29 (62)
Within	11 (23)	Placebo	4 (9)
Single-subject experimental	4 (9)	No instruction	17 (36)
Other	1 (2)	Distraction/neutral	3 (6)
		Do your best	6 (13)
Assignment Strategy			
Random assignment	21 (45)	Other	6 (13)
Matched	6 (13)	Not stated	6 (13)
Quasi-random	2 (4)	None	1 (2)
Nonrandom	2 (4)		3 (6)
Not applicable	14 (30)		
Not stated	2 (4)		

Note. *The totals in these design characteristics add up to more than 47 because some studies used more than one type of self-talk, manipulation check, or control condition.

and motivational self-talk. Given that researchers have proposed that these different types of self-talk ought to have differing, and at times contrasting, performance effects (e.g., Van Raalte, Brewer, Rivera, & Petitpas, 1994), we felt that greatest clarity would be obtained if we analyzed the effects of these types of self-talk separately. Table 3 contains the results regarding the effect of self-talk on performance. We identified 11 studies ($k = 16$) that had investigated positive or negative self-talk in relation to performance. Although positive self-talk was found to have a positive effect (75%) on performance, no support for an effect of negative self-talk (0%) was detected. As Theodorakis and colleagues' (2000) matching hypothesis implicates the relevance of task type for the relative effectiveness of instructional and motivational self-talk, this more contemporary body of literature was subdivided to help assess the independent effects of instructional and motivational self-talk on the performance of precision-oriented tasks ($k = 26$) and the execution of gross motor skills susceptible to the effects of physical conditioning ($k = 16$). When considering the effect of self-talk on precision-based tasks, both instructional (80%) and motivational (67%) self-talk were found to have a positive effect on performance. Similarly, instructional (70%) and motivational (83%) self-talk were found to have a positive effect on the performance of gross motor skills. Taken together, it would seem that the empirical literature would support the contention that self-talk is beneficial for athletic performance.

Moderator-Related Results

Type of Self-Talk. Table 3 presents results regarding the comparison of positive versus negative self-talk and instructional versus motivational self-talk. Given the commonly held belief that positive self-talk is better than negative self-talk, it is surprising that only four studies ($k = 5$) to date have addressed this issue. Nevertheless, the empirical research findings support this belief: when pitted against one another, 60% of the research indicated that positive self-talk was more beneficial for performance than negative self-talk, the remainder of research (40%) reported no performance differences between positive and negative self-talk. However, given the small number of effects we were able to analyze, continued investigation of this issue is warranted before firm conclusions can be drawn.

As mentioned earlier, the matching hypothesis presented by Theodorakis et al. (2000) highlights the potential role of different types of self-talk. Following an analysis of currently available literature, Table 3 illustrates the apparent lack of support within the literature for differential effects of instructional and motivational self-talk. Instructional self-talk was not consistently more effective than motivational self-talk for the execution of precision-oriented tasks. Moreover, motivational self-talk was not more effective than instructional self-talk for conditioning-based tasks in the vast majority of studies conducted to date.

Athlete Skill Level. Table 4 depicts results regarding the effect of self-talk on performance across different skill levels. No studies to date have directly addressed this issue. When isolating the findings of studies across different skill levels, the picture is somewhat mixed. While there is evidence supporting a positive effect of self-talk on performance for novices, youth athletes, and talented athletes, there was an indeterminate effect for student samples, and no effect for competitive adult athletes. Across the various samples, there was no evidence that self-talk

Table 3 Effects of Self-Talk on Performance

	Number of Studies	Number of Effects	Percentage of Effects Supporting the Presence of Effect			Sum Code
			+	-	0	
Influence on General Performance Levels						
Positive ST	11	12	75	0	25	+
Negative ST	3	4	0	0	100	0
Influence on Performance of Precision-Based Tasks						
Instructional ST	16	20	80	0	20	+
Motivational ST	6	6	67	0	33	+
Influence on Performance of Condition-Based Tasks						
Instructional ST	9	10	70	0	30	+
Motivational ST	6	6	83	0	17	+
Positive Versus Negative ST						
General performance	3	4		PST > NST	NST > PST	?
Instructional Versus Motivational ST			50	0	50	
Precision-based tasks	6	6	33	0	67	0
Condition-based tasks	8	8	0	12.5	87.5	0

Note. ST = self-talk, PST = positive self-talk, NST = negative self-talk, IST = instructional self-talk, and MST = motivational self-talk.

Table 4 Relationship Between Self-Talk and Performance Stratified by Skill Level

Athlete Skill Level	Number of Studies	Number of Effects	Percentage of Effects Supporting the Presence of Effect			Sum Code
			+	-	0	
Student	16	32	59	0	41	?
Novice	4	7	86	0	14	+
Youth	4	6	83	0	17	+
Competitive	3	12	25	0	75	0
Talented	9	18	88	0	12	+
Injured	1	1	100	0	0	+

had a negative influence on performance. However, given the small number of effects we were able to analyze in several athlete categories (e.g., competitive adults), continued investigation of this issue is warranted before firm conclusions can be drawn.

Mediation-Related Results

Table 5 summarizes research regarding potential mediators of the self-talk–performance relationship. As none of the included studies explicitly addresses mediation-based hypotheses, research was included if it examined the effect of self-talk on a proposed mediator.

Table 5 indicates repeated consistent positive effects of self-talk on cognitive and behavioral variables. All four studies examining cognition identified that self-talk had positive effects. Given that a wide range of dependent variables were examined within this category (e.g., the frequency of interfering thoughts, decision-making ability), replication of the specific findings is necessary. With regard to the behavior-focused studies, again unequivocal support was found for a beneficial effect of self-talk for both subjectively rated ($n = 6$) and objectively assessed ($n = 2$) tasks. Whereas the majority of these studies used instructional self-talk, changes in behavior were also reported when motivational self-talk was used (e.g., Tod et al., 2009).

With regards to motivational mediators, all the identified studies focused on self-confidence or self-efficacy. Overall, the findings regarding the effect of self-talk on confidence were inconsistent (43% positive effect, 57% no effect). Closer scrutiny suggests that this may be related to the type of self-talk used, however, with all studies using positive self-talk showing no effect and all studies using a motivational or instructional type of self-talk demonstrating a positive effect. Regarding affectual mechanisms, all studies examined the effect of self-talk on anxiety. A mixed picture emerged overall, however, and differential effects were identified when considering cognitive and somatic anxiety separately. All studies examining cognitive anxiety reported a beneficial effect of self-talk, whereas 75% of studies examining somatic anxiety showed no effect. Overall, there is some evidence that positive and motivational types of self-talk may decrease cognitive anxiety. The existing evidence regarding somatic anxiety demonstrates no clear effect.

Table 5 Summary of Research Examining Mediators of the Relationship Between Self-Talk and Performance

Category	Number of Studies	Number of Effects	Percentage of Effects Supporting the Presence of Effect			Sum Code
			+	-	0	
1. Cognitive	4	5	100	0	0	+
2. Motivational	7	7	43	0	57	?
3. Behavioral	8	10	100	0	0	+
4. Affectual	5	9	0	55	45	?

Note. Dependent variables were as follows: 1. attentional focus, suppression of distracting stimuli, frequency of interfering thoughts, and decision-making ability; 2. self-confidence and self-efficacy; 3. subjective rating of technique or movement execution, and vertical jump biometrics; and 4. pretest anxiety, and cognitive and somatic anxiety.

From reviewing the research, two other studies pertaining to potential mediators of the self-talk–performance relationship were identified, which were not easily integrated into the categories proposed in the model of J. Hardy and colleagues (2009). First, Rushall, Hall, Roux, Sasseville, and Rushall (1988) reported that heart rate was higher in self-talk conditions relative to a control condition. This finding suggests that physiological changes, perhaps linked to arousal or effort, may mediate effects of self-talk on performance. Second, Weinberg, Smith, Jackson, and Gould (1984) examined the effect of self-talk on ratings of perceived exertion, and found no differences between associative thinking, dissociative thinking, positive self-talk, and control groups.

Discussion

With regards to the primary purpose of the current study, our results offer initial support for the effectiveness of self-talk interventions. More specifically, consultants may be heartened to know that the performance benefits of self-talk were seen for the use of positive, instructional, and motivational categories of self-talk. Nevertheless, contrary to the sentiments expressed in applied texts (e.g., Bull, Albinson, & Shambrook, 1996) currently available data suggest that negative self-talk may not have a detrimental effect on motor skill performance. Some researchers (e.g., J. Hardy, Hall, & Alexander, 2001; Van Raalte et al., 1994) have posed a possible explanation for this null finding, namely, that some athletes may interpret their negative self-talk as having motivational qualities (e.g., following a silly mistake, athletes may give themselves a “talking to”). This null finding is also contrary to writings discussing the “power of non-negative thinking” (e.g., Kendall, 1984) and questions the value of thought-stopping interventions, which aim to reduce the amount of negative self-talk said by performers. The present sentiment augments previous authors’ ironic effects-related warnings surrounding the continued promotion of the thought-stopping technique by consultants (e.g., J. Hardy et al., 2009). In addition, given the coverage concerning the use of positive or negative self-talk within the self-talk literature, surprisingly few empirical examinations of the assumption that positive self-talk is better for performance than negative self-talk have been conducted. Although fairly consistent support was generated

for the use of positive self-talk compared with no self-talk, an inconsistent effect was detected for the possible benefits of positive self-talk over the use of negative self-talk. Given that the present analysis is based on the findings of only four studies, extreme caution is necessary when interpreting this finding. Nevertheless, the identification of this shortcoming within the self-talk literature highlights an avenue where additional research would continue to facilitate our understanding of the effects of negative self-talk.

A matching hypothesis principle (Theodorakis et al., 2000) is another potential influence shaping the nature of self-talk interventions. Pivotal to this principle is the precision or gross nature of the tasks being attempted. Our analysis provided a lack of support for this intuitively appealing matching principle. It is possible that other researchers may come to a more supportive conclusion, given that on occasion nonsignificant results have been interpreted in favor of the matching hypothesis principle. In such cases, relatively small sample sizes were employed reflective of the challenges of conducting research with very specific samples of the population (e.g., Harbalis et al., 2008; disability sport athletes). Nevertheless, taken collectively, the positive effects found for instructional and motivational self-talk (as opposed to a control condition) on the performance of both precision and conditioning-based tasks does provide preliminary evidence for the use of these cognitive strategies.

Such a statement might be best considered in the wider context that conclusions regarding this evidence base may vary according to the criteria investigators use to evaluate existing research. If, for example, meta-analyses of randomized trials were set as the benchmark, as is the case in some bodies of literature (e.g., see Guyatt et al., 2008; National Institute for Clinical Evidence; Scottish Intercollegiate Guidelines Network), then self-talk would be considered an unproven and unjustifiable intervention. Moreover, there remain some highly relevant yet unexamined factors, which if addressed, would lead to substantial knowledge advances. For instance, the few researchers who have attempted to collect competitive performance data have encountered problems; for example, Johnson, Hrycaiko, Johnson, and Halas (2004) were unable to collect sufficient soccer goal shooting data. As such, in most situations, practitioners cannot source empirical data to justify using self-talk interventions for competitive performance-enhancement purposes. Nonetheless, pending the utilization of appropriate study designs and a focus on measuring performance at a suitable level, it is possible to investigate the influence of self-talk on competitive performance. Rather than focus on competitive outcome or global performance, it may be more productive for researchers to examine self-talk's effectiveness in relation to discrete skills or performance processes, such as the number of successful tackles made during a rugby game or the proportion of goal kicking attempts that are successful. Such a focus might generate detailed information concerning the precise role(s) of self-talk in the competitive domain as well as illustrate to coaches and athletes the effectiveness of self-talk on variables they value.

Given the relative lack of self-talk investigations employing competitive or highly skilled athletes, more data gleaned from this seemingly elusive and small sample of the population is warranted. To date, single-subject multiple baseline designs have been a popular choice of method when involving such participants (e.g., Landin & Hebert, 1999). However, these studies have yet to employ contemporary quantifiable analysis strategies (e.g., ITSACORR; Crosbie, 1993) applicable to single-subject experimental designs and capable of revealing significant effects.

A complimentary strategy would be for self-talk researchers to ground future research within theories. Most of the research in the current review was issue, rather than theory, based. Typically, researchers did not conceptualize self-talk interventions around theoretical frameworks. Theoretically grounded interventions will assist in moving self-talk research's focus from first- to second-generation questions (i.e., from "does self-talk help?" to "what types of self-talk help?"). Answers to these second-generation questions might provide practitioners with advice that will allow them to design interventions that have a greater probability of being effective for their clients.

There already exist a number of theories with relevance to variables that have been viewed by self-talk researchers (e.g., J. Hardy, 2006) as offering at least partial explanation of the self-talk–performance relationship. For example, theorists have emphasized the role of self-talk in the interpretation and experience of affective states (e.g., Lazarus, 1991; Meichenbaum & Butler, 1979) and the initiation and regulation of behavior (e.g., Brinthaup, Hein, & Kramer, 2009). The present review provides some supportive evidence that self-talk also affects non-performance-based outcomes, and that the mediational categories proposed by J. Hardy and colleagues (2009) have relevance when seeking to understand the effects of self-talk on sporting performance.

More specifically, despite the paucity of the literature, the existent evidence base does suggest that self-talk has beneficial effects on cognition (in particular, concentration and focus-related variables), cognitive anxiety, and the technical execution of movement skills. The effect of self-talk on attentional variables is consistent with the suggestions of Landin (1994) that verbal cues could be used to increase focus as well as direct and redirect performers' attention. Building on evidence suggesting that self-talk influences concentration and attention, researchers have begun to apply contemporary theories to provide guidance regarding the precise nature and predicted effects of self-talk. For example, Bell and Hardy (2009) employed self-talk as an adjunct strategy to manipulate internal and external attentional foci to test the predictions of the constrained action hypothesis (e.g., Wulf, 2007). Continuing to develop and test theoretically grounded hypotheses with potential relevance to self-talk is likely to clarify the self-talk–attention relationship and provide clearer guidelines for practitioners. Furthermore, moderators such as skill level may be particularly salient to this issue, as researchers have suggested that the self-talk–attention association may be particularly relevant for beginners (Landin, 1994).

The beneficial effect of self-talk on cognitive anxiety is consistent with theoretical assertions that self-talk lies at the core of anxiety (Conroy & Metzler, 2004), and findings that reducing negative or anxious self-talk results in less anxious states (Kendall & Treadwell, 2007). It may be overly simplistic to focus solely on reducing negative self-talk, however, as some models have highlighted the importance of an optimal balance of positive and negative thoughts for well-being (e.g., state-of-mind ratios; Schwartz & Garamoni, 1986). In addition, the current results indicate that negative self-talk is not associated with reduced performance. It is perhaps unsurprising that the evidence did not support an effect of self-talk on somatic anxiety. Literature in both clinical and sporting populations highlights the importance of matching (mind–body) anxiety treatments to the mode of (cognitive–somatic) anxiety in order to maximize effectiveness (e.g., Maynard et al.,

1995). The effect of self-talk on behavioral factors is also supported by theoretical frameworks, which have particular relevance during the learning phase of skills acquisition. For example, it has been noted that novices tend to “talk” themselves through movements (Coker & Fischman, 2010; Fitts & Posner, 1967), and instructional self-talk may provide an appropriate content for this inner dialogue (J. Hardy et al., 2009). Furthermore, Wrisberg (1993) suggests that self-talk might influence learners’ performance by assisting with the “chunking” of complex information sequences, assisting with the recall and execution of complex movement patterns.

Although self-talk is often promoted as a means of enhancing confidence (Zinsser et al., 2010), as previously mentioned, the findings regarding the effect of self-talk on confidence were inconsistent: motivational self-talk appears to enhance confidence, whereas positive self-talk does not. It is possible that this difference may be due to the specificity of the self-talk interventions; several of the studies that examined positive self-talk in the context of confidence-related beliefs employed a positive thought control intervention. Such interventions are more all encompassing and so are likely to be less closely linked with a focused issue such as confidence beliefs than the specific encouraging-type statements typically used as motivational self-talk (e.g., “come on, you can do it”). The effect of motivational self-talk on confidence is consistent with the role of verbal persuasion as an antecedent of efficacy, as discussed by Bandura (1997).

The review highlighted some additional noteworthy points regarding J. Hardy and colleagues’ (2009) model. Although there was support for positive effects of self-talk on cognitive and behavioral factors, the terminology used to describe each category is broad, and hence the variables included within each category are diverse. For example, the cognitive category included decision making, attentional focus, and interfering thoughts. The precise rationale for effects of self-talk and the way that self-talk might influence each of these variables remains to be clarified. Conversely, J. Hardy and colleagues’ motivational category encompassed a range of motivational factors, including persistence, quality of motivation, and competence or self-confidence. Thus far, research within this theme has exclusively focused on the effects of self-talk on efficacy-based beliefs. There is clearly room for enriching the study of these themes. Although a perhaps inevitable consequence of the still-emerging literature, from a critical perspective, the breadth of the categories in J. Hardy and colleagues’ model provides little focused guidance for researchers or practitioners.

Despite the breadth of the mediator categories in J. Hardy and colleagues’ model, this review highlighted two factors that were not consistent with any one category. First, Rushall et al. (1988) identified a physiological effect of self-talk in the form of increased heart rate. From a theoretical perspective, if considering heart rate as an indicator of arousal, based on the circumplex model of affect (Russell, 1980), the findings of this study could be incorporated into the affectual dimension of mediators. However, an alternative argument could be made that a novel category should be added to the J. Hardy et al. model to include physiological effects of self-talk. This could potentially represent effects of self-talk on variables such as hormones or neurotransmitters. The second nonclassifiable effect was measured in Weinberg et al.’s (1984) study that examined ratings of perceived exertion. Perceptions of exertion could be argued to include cognitive, motivational, and affective elements, and, without clear hypotheses to ground the predicted effect of the types

of self-talk used on perceived exertion, it is difficult to determine one classification for this mediator, and perhaps unsurprising that no effect was found. The identification of additional potentially explanatory mechanisms of the self-talk–performance relationship further develops the framework of J. Hardy and colleagues. Similarly, identifying unsupported mechanisms (e.g., somatic anxiety) helps further refine the model and counter claims that, owing to the (current) breadth of the themes, self-talk is viewed as a panacea for all sports-related ailments.

Adopting a broader service delivery perspective on the mediating mechanisms, it is not known if self-talk works because of the specific education involved in teaching athletes to use particular verbal cues or because of some other less specific factors, such as increased expectation, hope, or practitioner allegiance. Psychotherapy research indicates that the specific factors or interventions account for much less outcome variance than the nonspecific factors, such as the bonds formed between the parties (Wampold, 2001). Applying these findings to self-talk and sport, potentially, self-talk interventions are helpful, but not as a result of the specific cues used in the intervention. Instead, the nonspecific factors, which to date have not been assessed or controlled, may be responsible for effectiveness. By including measures of, or controlling for, nonspecific factors (e.g., increased expectation or practitioner allegiance) in their designs to help identify the active ingredients in service delivery, researchers can further advance knowledge concerning self-talk's effectiveness.

There are a number of limitations associated with the current study that ought to be acknowledged. First, although restricting the sample to English-only articles ensured consistency that all articles were thoroughly critiqued, this may have resulted in the omission of relevant, high-quality literature. This issue is highlighted when specific research questions have been investigated only in a relatively limited number of studies. For example, we are aware that additional work has compared the effect of positive and negative self-talk on performance (Dagrou & Gauvin, 1992), and the inclusion of this would have altered the interpretation of the evidence base. This example helps to illustrate how the present review's findings are dependent on available data, as well as serving to demonstrate a second noteworthy point, which is that the use of Sallis et al.'s (2000) accepted coding system may appear to produce more definite categorical conclusions than critical inspection of the literature would support. To compensate for this, we have augmented categorizations with narrative discussion to more fully reflect the literature. We would urge researchers and practitioners to fully consider the nature of the evidence base, and to apply any of the review's summation with appropriate caution. This is a critical issue, as the drawing of premature conclusions may shunt the literature in aspects of potential important relevance. Lastly, although the current study summarizes the evidence regarding whether effects of self-talk are supported, it is unable to generate information concerning the strength of any of these effects.

It appears from our analysis of the sports-based self-talk literature that practitioners' promotion of this psychological skill for performance enhancement purposes has some support, although the breadth of the knowledge base needs expanding (e.g., examining the intervention's efficacy in competitive situations). Furthermore, there is some emerging support of its supplementary, more process-oriented uses (e.g., to reduce cognitive state anxiety). Theoretically, the present findings extended the J. Hardy et al. (2009) framework concerning the mechanisms behind the self-

talk–performance relationship. Finally, preliminary evidence encouraging closer scrutiny of two popular current viewpoints on self-talk emerged. The existing literature suggests that negative self-talk does not impede performance, and there does not appear to be consistent support for the differential effects of instructional and motivational self-talk.

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