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Self-Talk: It Works, but How? Development and Preliminary Validation of the Functions of Self-Talk Questionnaire

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The aim of this investigation was to develop an instrument assessing the functions of self-talk (ST) in sports. Two studies were conducted for the development of the Functions of Self-Talk Questionnaire (FSTQ). In the first study, a prospective instrument was developed based on empirical evidence and a series of preliminary exploratory factor analysis. The results supported a five-dimensional 25-item solution. In the second study, the psychometric properties of the new questionnaire were tested. Confirmatory factor analysis (CFA) confirmed the hypothesized factor structure of the FSTQ. Furthermore, reliability analyses provided further evidence regarding the psychometric integrity of the instrument. The results of the study provide preliminary evidence regarding the multidimensionality of ST functions, suggesting that ST in sports can serve to enhance attentional focus, increase confidence, regulate effort, control cognitive and emotional reactions, and trigger automatic execution. The FSTQ seems a psychometrically sound instrument that could help with enhancing our understanding regarding the use and effectiveness of ST.

Key words: ST functions, confidence, automaticity, attention, effort, cognitive and emotional control

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Cognitive theorists have long emphasized the link between what people say to themselves and how they behave (Ellis, 1994; Meichenbaum, 1977). Based on this foundation, models of self-regulation strategies have investigated the strategies that athletes often use to regulate their cognitions and behavior for enhancing performance. Cognitive strategies involve active mental processes designed to change or influence existing thought patterns, and the interest of sport psychologists in researching those techniques and designing mental training programs is progressively growing. Results from various studies indicate that successful athletes, in cooperation with coaches, use cognitive strategies more often than less-successful athletes (e.g., Gould, Eklund, & Jackson, 1992; Gould, Tammen, Murphy, & May, 1989), and these strategies have generally been found to be effective in enhancing performance (e.g., Hanton & Jones, 1999; Thelwell & Maynard, 2003).

One of the most pervasive of the cognitive strategies employed by athletes is self-talk (ST). ST has been central to cognitive and cognitive-behavioral interventions (Conroy & Metzler, 2004) and has recently received significant research interest in the applied sport psychology field. ST refers to statements people make to themselves, either internally or aloud, and has been defined as an "internal dialogue in which the individuals interpret feelings and perceptions, regulate and change evaluations and cognitions and give themselves instructions and reinforcement" (Hackfort & Schwenkmezger, 1993, p. 355). Originally, researchers discriminated between two broad dimensions of ST—positive and negative ST. Positive ST was described as self-addressed statements involving praise and encouragement, whereas negative ST was described as statements involving criticism and self-preoccupation (Moran, 1996). More contemporary approaches further discriminate ST in relation to the purposes it serves. Zinsser, Bunker, and Williams (2001) identify that ST can be characterized as instructional or motivational. Instructional ST refers to statements related to attentional focus, technical information, and tactical choices, whereas motivational ST refers to statements related to confidence building, effort input, and positive moods. Following the research advances, Hardy and colleagues (Hardy, 2006; Hardy, Hall & Hardy 2005) proposed a more comprehensive definition of ST. They described ST as a multidimensional, dynamic phenomenon concerned with athletes' verbalizations that are addressed to themselves. These verbalizations have interpretive elements associated with the content of the statements, and serve at least two purposes—instructional and motivational.

Initial research focused on the examination of the effects of positive and negative ST on performance. In field studies, results have been equivocal. Highlen and Bennett (1983) reported that elite divers who qualified for the Pan American games were using more content-based self-instruction during competition than non-qualifiers. Van Raalte, Brewer, Rivera, and Petitpas (1994) systematically observed the ST of junior tennis players. Results indicated that

winners used less negative ST than losers. In contrast, in a methodologically alike study with adults (Van Raalte, Cornelius, Brewer, & Hatten, 2000), negative ST was not associated with losing. Similarly, Rotella, Gansneder, Ojala, and Billings (1980) found that successful and less-successful elite skiers did not differ in terms of their ST, and Dagrou, Gauvin, and Halliwell (1991) reported that elite athletes reported using the same type of ST for their best and worst performances. Nevertheless, experimental research, where ST has been employed as a performance-improving strategy with specific cues being used, has provided more consistent results regarding the effectiveness of positive ST. In particular, positive ST has been found to have positive effects on performance of experimental tasks involving golf (Johnson-O'Connor & Kirschenbaum, 1982), endurance (Weinberg, Smith, Jackson, & Gould, 1984), basketball (Hamilton & Fremour, 1985), skiing (Rushall, Hall, Roux, Sasseville, & Rushall, 1988), and dart throwing (Van Raalte, Brewer, Lewis, Linder, Wildman, & Kozimor, 1995).

More recently, attempts have been made to investigate the effects of instructional and motivational ST on performance. Mallett and Hanrahan (1997) and Landin and Hebert (1999) reported that the use of instructional ST significantly improved performance of elite sprinters and tennis players, respectively. Theodorakis, Chroni, Laparidis, Bebetsos, and Douma (2001) examined the effects of instructional ST on a basketball-shooting task. The results indicated that participants using appropriate-for-the-task ST improved their performance as compared to those using inappropriate ST and those of a control group. In one of the few ST intervention studies, Perkos, Theodorakis, and Chroni (2002) tested the effectiveness of a 12-week program involving instructional ST on basketball tasks. They reported that, at the end of the program, dribbling and passing performance of the experimental group was significantly better than that of the control group. Finally, in another intervention study, Johnson, Hrycaiko, Johnson, and Hallas (2004) examined the effectiveness of an ST program on skilled female soccer players, using single-subject multiple baseline design. The results revealed that performance on a shooting task improved for two of the three participants who practiced ST.

Theodorakis, Weinberg, Natsis, Douma, and Kazakas (2000) speculated that the effects of ST on performance should depend on the nature of the task to be performed. After conducting four experiments involving heterogeneous tasks, they found that for tasks involving fine execution, instructional ST was more effective, whereas for tasks requiring gross execution, instructional and motivational ST were equally effective. Hatzigeorgiadis, Theodorakis, and Zourbanos (2004) compared the effectiveness of instructional and motivational ST on a precision and on a power task. The results revealed that for the precision task, both types of ST facilitated performance with instructional ST being more effective, whereas for the power task, only motivational ST facilitated

performance. The researchers suggested that the effectiveness of ST depends on the appropriate selection of ST cues in relation to the nature of the task.

Summarizing the above research, it becomes evident that ST can be an effective cognitive strategy for performance enhancement. Nevertheless, there is a dearth of research regarding the likely functions through which ST affects performance. In the literature, the distinction between positive and negative ST, as well as between instructional and motivational ST, has not been explicitly clear (Conroy & Metzler, 2004). The terms have been used to describe either the content (e.g., positively-phrased cues) or the effects (positive in relation to performance) ST may have, and this seems to obscure the identification of the functions of ST. Thus, the exploration of the functions through which ST operates can enhance our understanding of the ST phenomenon.

Meichenbaum (1977), in his self-instructional approach to cognitive-behavior modification, highlighted the significance of examining the functions through which (*how*) self-statements affect behavioral processes. He suggested that "the goal of a cognitive functional assessment is to describe … the functional significance of engaging in self-statements of a particular sort followed by an individual's particular behavior" (p. 202). Meichenbaum viewed self-statements as indices of individuals' beliefs that may play a mediational role in behavioral performance. He supported that self-statement instructions can direct individuals' attention to task-relevant dimensions, maintain information in the short-term memory, and ward off disturbing thoughts. Furthermore, he claimed that self-statements can influence individuals' expectations regarding their capacity to handle a situation, can be used in an attempt to reassure themselves, and to note behaviors that should become cues for action. Meichenbaum concluded that internal dialogue influences individuals' attentional and appraisal processes.

Hardy (2006), in a critical review of the ST literature, presented a series of other theories that may help one understand the way ST functions. In considering Nideffer's (1993) approach to attentional style, Hardy proposed that the use of ST cues may help switching attentional focus but also maintaining appropriate focus for specific tasks. A similar reasoning could be based on Easterbrook's (1959) attentional-narrowing hypothesis. Easterbrook postulated that in simple tasks, where few cues are relevant to the execution, the narrowing of attention can facilitate performance. Considering Easterbrook's suggestions, it could be argued that the use of ST may help narrowing attention to task-specific cues. Hardy (2006) also considered the relevance of Bandura's (1997) self-efficacy theory. According to the theory, verbal persuasion from external sources or oneself may influence one's efficacy beliefs. Hardy suggested that persuasion self-statements may be said to have an impact on individuals' confidence with regard to goal achievement. Finally, Landin (1994) forwarded an information-processing perspective, suggesting that verbal cues may help individuals searching for

correct task stimuli, but also setting the individual in a state of readiness, by initiating a sequence of actions that can be subsequently executed with little or no attention, assuming that the execution of the task is efficiently mastered.

Although these propositions have not been directly tested in relation to the effectiveness of ST in sports, several studies have provided relevant preliminary evidence regarding the effects of ST, and several explanations concerning the functions of ST have been suggested. Thus, ST has been proposed to enhance self-confidence and increase effort (Finn, 1985; Hardy, Jones, & Gould, 1996; Zinsser et al., 2001), regulate mood and anxiety (Hardy et al.; 1996; Zinsser et al., 2001), control attention (Landin, 1994; Nideffer, 1993), and trigger desired actions effectively (Hardy et al.; 1996). Hardy, Gammage, and Hall (2001), using qualitative methodology and following Paivio's (1985) conceptualization of imagery, examined the reasons for which athletes use ST. The researchers grouped responses into cognitive and motivational categories, which were further divided into cognitive specific, cognitive general, motivational mastery, motivational arousal, and motivational drive. Both categories included outcome, but also process functions which, however, were not discriminated. Outcome functions included skill development, strategy improvement, and performance enhancement, whereas process functions referred to enhancing focus, regulating arousal, maximizing effort, building confidence, and increasing mental readiness. At that point, it is important to indicate that Hardy conceptualized functions in a different way than Meichenbaum (1977). In particular, Hardy described functions as the purposes for which athletes use ST (*why*); that is, what athletes sought to achieve through the use of ST. In the present investigation, following Meichenbaum's approach, functions were conceptualized as the likely mechanisms through which ST operates; that is, *how* changes attributed to ST occur.

Further preliminary evidence regarding how ST operates has been provided through studies employing various designs that examined the effectiveness of ST. In a field study with tennis players, Van Raalte et al. (1994) identified the motivational and calming effects of ST. In an intervention study employing a free-throw task, novice basketball players reported that the use of ST mostly helped them to improve concentration, but also to increase confidence and regulate mood (Perkos et al., 2002). Similar results were also reported by Thelwell and Greenlees (2003) in a qualitative inquiry examining the effectiveness of a mental skills training plan on a triathlon task. Post-treatment interviews revealed that the use of ST helped them increase motivation, confidence, and attentional focus. Finally, Johnson et al. (2004), in an intervention study employing a single-subject multiple-baseline design with female soccer players, reported that according to participants' perceptions, ST helped them increase confidence and focus their attention on relevant cues.

In one of the few attempts to examine the way ST functions, Hatzigeorgiadis et al. (2004) examined the effectiveness of ST in relation to attentional processes.

In two experiments that were conducted, it was found that the use of ST reduced the occurrence of interfering thoughts, thus implying that attention to the task at hand was enhanced. Moreover, Hardy, Hall, Gibbs, and Greenslade (2005), in an experimental task, reported that positive ST was positively correlated with self-efficacy and suggested that self-efficacy may mediate the relationship between ST and performance.

Considering the evidence regarding the effectiveness of ST, but also the importance of selecting the appropriate ST type plans in relation to the requirements of the task and the needs of the individual, it is crucial to be able to identify how ST functions. If ST serves several functions or if different ST types serve different functions, then to be able to design and implement effective ST plans, it is important to understand how ST operates. The purpose of the present investigation was to develop an instrument examining the way ST functions. Beyond the understanding for the mechanisms through which ST operates, such an instrument could serve in experimental studies as manipulation check regarding the desired effects of ST plans, follow-up assessments of ST intervention programs, but also for purposes of assessment and diagnosis regarding appropriate types of ST in relation to particular sports and athletes' strengths and weaknesses.

Two studies were conducted. The first study involved item selection and identification of the factor structure of the questionnaire. In the second, the psychometric properties of the instrument that emerged were tested. Ethical approval for the conduct of the investigation was granted from the university's research ethics committee.

STUDY 1

The purpose of the first study was to identify likely functions of ST and develop a pool of items that would be tested in the subsequent stages of the investigation. Item selection was based on empirical evidence regarding the functions of ST and a series of principal components analyses. The factorial structure of the prospective instrument was examined through further exploratory factor analysis.

Development of Instrument

Method. Item selection was based on empirical evidence regarding the likely effects of ST (Finn, 1985; Hardy et al., 1996; Hatzigeorgiadis et al., 2004; Landin, 1994; Nideffer, 1993, Van Raalte et al., 1994), data themes from exploratory studies (Hardy et al., 2001; Thelwell & Greenlees, 2003), and

raw data collected from athletes through open-ended questionnaires. Athletes ($N = 120$, mean age $= 20.67 \pm 4.42$ years) from a variety of sports were recruited. They were assured that it is a common phenomenon that athletes talk to themselves and were informed that we were interested in investigating what they believe happens when they do that. They were subsequently asked to indicate whether they talk to themselves during training or competition, to report examples of cues they usually employ, and to report how these self-statements affect them. All 120 athletes reported at least one example of ST that they use and the functions ST serves. The most frequently-cited responses were that ST served to "raise/increase/enhance feelings of confidence and belief," to "focus/direct/control attention and concentration for the execution of skills," and to "sustain/increase/maximize effort." Overall, a preliminary pool of 64 items was initially created. The criterion for the primary selection was whether the items responded to the question in hand (i.e., the possible mechanisms through which ST functions). Three individuals with expertise in sport psychology and psychometrics were introduced to the criterion and evaluated the items. Judges were asked to characterize the prospective items as 'relevant' or 'not relevant' with regard to the criterion. According to the estimation procedures of the Content Validity Index (Lynn, 1986), when there are less than five judges, all must agree to the relevance for an item to be considered appropriate. A less-stringent criterion was adopted in order not to eliminate too many items before proceeding to the factor analysis. Thus, 54 items, on which two of the three judges agreed, were initially selected. The items were subsequently screened to eliminate redundant items, which resulted in a pool of 45 items.

The initial instrument was distributed to 251 athletes (161 males and 90 females; mean age 19.68 ± 4.22 years; mean competitive experience 9.23 ± 4.24 years) representing a variety of individual (athletics, swimming, tennis, weight lifting, skiing; $n = 122$) and team (football, basketball, volleyball; $n = 129$) sports. In considering their competitive level, 22.5% of them had competed at international level, 52.7% at national level, and 24.8% at regional or county level. Participants were informed that the forms they were going to complete were anonymous, and they signed a consent form. The questionnaire form began with a brief description of ST. Participants were asked to indicate whether they talk to themselves while performing and, if so, to report examples of ST they usually engage in during training or competition. Subsequently, they were asked to report their perceptions regarding the functions of their ST by completing the 45-item instrument, stemmed by the phrase "when I talk to myself during training or competition ...," on a 7-point scale ($1 =$ *not at all*, $7 =$ *very much*).

Results. Theorists suggest that factor analytic methods are more robust than principal components analysis for identifying the structure and the relationships

between latent constructs (Floyd & Widaman, 1995). Nevertheless, some suggest that principal components analysis should precede factor analysis because it helps in identifying the number of factors to be interpreted (Kline, 1994; Tabachnick and Fidell, 1996). Thus, principal components analysis was initially performed (SPSS 11.0.1). Examination of the scree plot suggested that five factors should be interpreted. A forced 5-factor solution with principal axis factoring and oblique rotation was subsequently performed to identify the underlying dimensions. The five factors explained 59.37% of the total variance. Items with higher loadings on each factor were examined to identify the respective dimensions. In the first factor, items with the highest loadings were "I try harder," "I keep trying my best," and "I maintain effort to high levels." This factor was described as 'effort–motivation.' In the second factor, items with the highest loadings were "I let go of my anxiety," "I interrupt negative thoughts," and "I stay calm." This factor was described as 'cognitive and emotional control.' In the third factor, items with the highest loadings were "I feel more certain for myself," "I feel more confident in my abilities," and "I feel stronger." This factor was described as 'confidence–belief.' In the fourth factor, items with the highest loadings were "I execute impulsively," "I execute automatically," and "I execute as if on an automatic pilot." This factor was described as 'automaticity.' Finally, in the fifth factor, items with the highest loadings were "I concentrate on what I have to do," "I direct my attention efficiently," and "I stay focused." This factor was described as 'attention–concentration.' Based on the results of the preliminary analysis, the instrument was revised. Items with loadings lower than .30 and items with similar loadings on two or more factors were eliminated. Some items were reworded to improve generalizability (e.g., "I concentrate on my tempo" was reworded to "I concentrate on what I am doing," or "I believe I can score" was reworded to "I believe in my abilities"), and some items were added (e.g., "the execution is spontaneous") to better define the underlying dimensions and to obtain a balanced, in terms of number of items, structure. A 30-item questionnaire emerged, comprising six items for each hypothesised dimension.

Exploration of Factor Structure

Method. The prospective instrument was then administered to 209 athletes (129 males and 80 females), representing a variety of individual (athletics, swimming, tennis, weight lifting, gymnastics; $n = 126$) and team (football, basketball, volleyball, rowing; $n = 83$) sports. The mean age of participants was 19.65 $\pm$ 3.32 years, and the mean competitive experience was 5.60 $\pm$ 2.68 years. In considering their competitive level, 12.3% of them had competed at international level, 40.3% at national level, and 46.4% at regional or county level.

Participants were informed that the form they were going to complete was anonymous, and they signed a consent form. The questionnaire form began with a brief description of ST. Participants were asked to indicate whether they talk to themselves while performing and, if so, to report examples of ST they usually engage in during training or competition. Subsequently, they were asked to report their perceptions regarding the functions of their ST by completing the 30-item instrument, stemmed by the phrase "when I talk to myself during training or competition ...," on a seven-point scale (1 = *not at all*, 7 = *very much*).

Results. Although there were certain expectations regarding the structure of the questionnaire, exploratory, rather than confirmatory, factor analysis was again conducted to identify the underlying dimensions of the instrument because items were reworded and added, and the instrument was still in the construction phase (Henson & Roberts, 2006). Principal components analysis revealed six factors with eigenvalues greater than one; however, examination of the scree plot indicated that a 5- or a 6-factor solution should be considered. To further clarify the number of factors to be interpreted, factor analysis on both solutions was performed (Floyd & Widaman, 1995). In the first analysis, the 6-factor solution was tested using principal axis factoring and oblique rotation because factors were correlated. The analysis revealed that the 5-factor solution should be interpreted because the sixth factor included only one item. The five factors represented the dimensions of effort, automaticity, cognitive and emotional control, attention, and confidence. Furthermore, it was revealed that (a) the item in the sixth factor came from the automaticity dimension (*I execute effortless*), (b) one item from the effort dimension had a loading smaller than .30 on all factors (*I put all my effort*), (c) one item from the attention dimension cross-loaded on the cognitive and emotional control factor (*I control my concentration*), and (d) one item from the cognitive and emotional control dimension cross-loaded on effort dimension (*I relax*). In the final analysis, a 5-factor solution (principal axis factoring) was tested using oblique rotation. After deleting the problematic items identified above and the item with the lowest loading from the confidence dimension (*I believe in my abilities*) for reasons of scale symmetry, a 25-item solution was tested. A clear 5-factor solution emerged. The five factors had eigenvalues exceeding 1 and explained 63.88% of the variance, whereas all factor loadings were above .47. The results of the analysis are presented in Table 1. The 25-item, 5-factor solution was retained to be tested in the next stage of the investigation. Descriptive statistics indicated the highest scores on the effort and attention factors, and the lower on automaticity. Cronbach's alpha ranged from .78 to .87, providing preliminary evidence on the internal consistency of the subscales. Descriptive statistics, Cronbach's alpha coefficients, and correlations between the subscales are presented in Table 2.

TABLE 1
Study 1: Exploratory Factor Analysis for the Functions of Self-Talk Questionnaire ($N = 209$)

	Factors					
	1	*2*	*3*	*4*	*5*	*Communalities*
Effort						
I try harder	.47					.71
I make my efforts more intense	.51					.46
I increase effort	.57					.59
I keep trying my best	.51					.62
I maintain effort to high levels	.67					.45
Automaticity						
I execute as if on an automatic pilot		.62				.44
The execution is spontaneous		.79				.88
I execute automatically		.71				.47
The execution comes automatic		.70				.68
I execute impulsively		.69				.62
Cognitive and emotional control						
I reduce my nervousness			.59			.39
I let go of my anxiety			.64			.42
I feel more relaxed			.67			.53
I interrupt negative thoughts			.52			.44
I stay calm			.49			.52
Attention						
I concentrate better on the execution				−.72		.60
I concentrate on what I have to do				−.85		.67
I direct my attention efficiently				−.69		.61
I stay focused				−.54		.57
I concentrate on what I'm doing at the moment				−.49		.50
Confidence						
I boost my confidence					−.67	.58
I feel more certain for myself					−.53	.48
I feel stronger					−.64	.54
I psych-up myself					−.57	.55
I feel more confident in my abilities					−.70	.68
Interfactor correlations						
Automaticity	.01					
Cognitive and emotional control	.20	.17				
Attention	−.35	−.15	−.33			
Confidence	−.33	−.14	−.35	.44		
Variance (%)	35.51	11.28	6.93	5.35	4.82	
Eigenvalue	8.88	2.82	1.73	1.34	1.21	

KMO: .89;
Bartlett test of sphericity: 2,703.13; $p < .001$.

TABLE 2
Study 1: Descriptive Statistics, Cronbach's Alpha, and Correlations for the Functions of Self-Talk Questionnaire Subscales ($N = 209$)

	Descriptive Statistics					*Correlations*			
	M	*SD*	*Skewness*	*Kurtosis*	*Cronbach's Alpha*	*1*	*2*	*3*	*4*
1. Confidence	5.02	1.19	−.61	.21	.86				
2. Automaticity	4.03	1.24	−.07	−.09	.83	.17*			
3. Cognitive and emotional control	4.65	1.18	−.26	−.11	.78	.54**	.24*		
4. Attention	5.49	1.07	−.43	−.50	.86	.60**	.17*	.47**	
5. Effort	5.49	1.06	−.74	.61	.87	.68**	.19**	.46**	.65**

Note. Standard error for skewness, .17; kurtosis, .34.
*$p < .05$, **$p < .01$.

STUDY 2

The purpose of the second study was to test the factorial validity of the Functions of Self-Talk Questionnaire (FSTQ), and to provide further evidence regarding the reliability and the validity of the scale. Confirmatory factor analysis (CFA) was performed to test the factor structure that emerged from the first study. Correlations between the instruments' subscales and social desirability were calculated to test for social desirability effects. Finally, internal consistency and test–retest reliability were calculated to test the reliability of the instrument.

Method

The 5-factor, 25-item instrument that emerged from the exploratory factor analysis was tested on a new sample. The sample consisted of 382 athletes (228 males and 154 females) representing a variety of individual (athletics, swimming, tennis, weight lifting; $n = 111$) and team (football, basketball, volleyball; $n = 271$) sports. The mean age of participants was 20.50 ± 4.74 years and the mean competitive experience 7.71 ± 4.23 years. In considering their competitive level, 11.4% of them had competed at international level, 45.5% at national level, and 43.2% at regional or county level. For purposes of test–retest reliability, 44 of the participants re-completed the instrument on a second occasion 1 month after the initial completion.

Participants were informed that the form they were going to complete was anonymous, and they signed a consent form. The questionnaire form began with

a brief description of ST. Participants were asked to indicate whether they talk to themselves while performing and, if so, to report examples of ST they usually engage in during training or competition. Subsequently, they were asked to report their perceptions regarding the functions of their ST by completing the 25-item instrument, stemmed by the phrase "when I talk to myself during training or competition ...," on a seven-point scale (1 = *not at all*, 7 = *very much*).

Finally, participants were asked to complete a social-desirability inventory (Crowne & Marlowe, 1960). The questionnaire comprised 10 items (e.g.,"I am always polite") scored on a true/false (0 = *false*, 1 = *true*) format. Total scores were estimated, with high scores indicating high social desirability.

The factor structure of the questionnaire that emerged from the exploratory factor analysis was tested through CFA. Following Hoyle and Panter's (1995) recommendations regarding the evaluation of model fit, in addition to the chi-square, which is considered overrestrictive as an evaluation of good fit due to its sensitivity to sample size, alternative fit indices were used to assess the adequacy of the postulated model. The Comparative Fit Index (CFI) and the Non-Normed Fit Index (NNFI) were used to compare the hypothesized model with the independence model. The CFI is sensitive to sample size, whereas NNFI is sensitive to model complexity. The Standardized Root Mean Square Residual (SRMR) was also employed, which shows the average of the standardized residuals between the specified and obtained variance–covariance matrixes. Finally, the Root Mean Square Error of Approximation (RMSEA) was utilized to assess the closeness of fit of the hypothesized model to the population covariance matrix. Values greater than .90 for the NNFI and the CFI are considered to be indicative of adequate fit, although values approaching the .95 are preferable (Hu and Bentler, 1999), whereas values smaller than .08 and close to .05 for the SRMR and the RMSEA are considered supportive of good fit.

Results

CFA, using EQS 5.7 (Bentler, 1995), was conducted to test the model. Model parameters were estimated based on the covariance matrix and using the maximum likelihood method. A 5-factor correlated model was estimated with each factor defined by five unique indicators from the FSTQ with uncorrelated residuals for the indicators. The fit indices for the model are presented in Table 3. The results revealed that the chi-square statistic was significant, implying that there was a discrepancy between the observed and the implied covariance matrix; however, all other fit indices supported the adequacy of the model in accordance with Hu and Bentler's (1999) contemporary cutoff criteria for fit indices. The factor loadings, the uniqueness, and the squared multiple correlations of each item in the 5-correlated-factor model are presented in Table 3. All items had

high loadings and relatively low errors, which, in addition to the adequacy of the fit indices, support the hypothesized factor structure of the instrument.[1]

Descriptive statistics, Cronbach's alphas, and correlations for all subscales are presented in Table 4. As in the previous study, descriptive statistics indicated the highest scores on effort and attention, and the lowest on the automaticity subscale. Internal consistency was acceptable for all the subscales, with Cronbach's alpha varying from .78 to .86. Finally, test–retest reliability on a subsample of 44 athletes indicated satisfactory coefficients (r ranging from .81 to .88). A comparison between Table 2 and Table 4 reveals that descriptive statistics and correlations for all variables were very similar for the two studies.

Finally, correlations were calculated to examine relationships of the FSTQ subscales with social desirability. The analysis revealed that all correlations between the FSTQ subscales and social desirability were low (Table 4).

DISCUSSION

Despite the considerable evidence regarding the effectiveness of ST, there is a dearth of research regarding the likely functions of ST (i.e., the mechanisms through which ST may be beneficial to performance). Conroy and Metzler (2004) identified that definitions and classifications of ST are not well-established in the sport psychology literature. Previous studies on ST, either observational or experimental, have generally neglected to describe or explain relationships between different types of ST and their effects, and this scheme is atheoretical in nature (Conroy & Metzler, 2004; Hardy et al., 2001). The purpose of the present study was to develop an instrument examining functions of ST based on athletes' perceptions. Two studies were conducted. In the first study, the likely functions of ST were examined through literature review and empirical evidence, and the factor structure of the instrument was explored. In the second, aspects of validity and reliability were tested and some descriptive analyses were performed.

The purpose of the first study was to identify the likely functions of ST, create an initial pool of items, and to examine the structure of the instrument. The existing ST literature emphasizes that ST can be used to increase confidence (e.g., Finn, 1985; Hardy et al., 1996), enhance attentional focus (Landin, 1994; Nideffer, 1993), control anxiety (Finn, 1985), and regulate effort (Hardy et al., 1996). In addition to those, Hardy et al. (1996) identified that ST can be used to trigger automatic execution. Automatic execution has been characterized as an element of expert execution, where performance is smooth and conscious cognitive control is minimal (Thomas, Murphy, & Hardy, 1999). The fact that

[1]A 1-factor and a 5-uncorrelated-factor solution were also tested, and the analyses showed poor fit (CFI = .74 for both models).

TABLE 3
Study 2: CFA for the Functions of Self-Talk Questionnaire—Parameter Estimates and Fit Indices ($N = 382$)

	Factor loading	*Uniqueness*	R^2
Confidence			
I boost my confidence (2)	.77	.64	.59
I feel more certain for myself (7)	.77	.69	.52
I feel stronger (12)	.72	.64	.59
I psych-up myself (17)	.73	.69	.53
I feel more confident in my abilities (22)	.73	.68	.54
Automaticity			
I execute as if on an automatic pilot (3)	.63	.77	.40
The execution is spontaneous (8)	.73	.69	.53
I execute automatically (13)	.71	.70	.51
The execution comes automatic (18)	.77	.64	.59
I execute impulsively (23)	.79	.62	.62
Cognitive and emotional control			
I reduce my nervousness (4)	.51	.86	.26
I let go of my anxiety (9)	.62	.78	.39
I feel more relaxed (14)	.69	.73	.47
I interrupt negative thoughts (19)	.65	.76	.42
I stay calm (24)	.73	.69	.53
Attention			
I concentrate better on the execution (5)	.74	.67	.55
I stay focused (10)	.73	.68	.53
I concentrate on what I have to do (15)	.80	.60	.64
I direct my attention efficiently (20)	.68	.73	.46
I concentrate on what I'm doing at the moment (25)	.67	.74	.45
Effort			
I try harder (1)	.61	.79	.38
I make my efforts more intense (6)	.82	.57	.68
I increase effort (11)	.77	.64	.59
I keep trying my best (16)	.68	.74	.46
I maintain effort to high levels (21)	.81	.58	.66

Fit indices: χ^2, *df, 275* 1,490.94*; NNFI, .94; CFI, .95; SRMR, .04; RMSEA, .05.

Note. The order of the items appears in the parentheses.
*p < .001.

TABLE 4
Study 2: Descriptive Statistics, Cronbach's Alpha, and Correlations for the Functions of Self-Talk Questionnaire Subscales (*N=382)*

	Descriptive Statistics				*Reliability*		*Correlations*				
	M	*SD*	*Skewness*	*Kurtosis*	*Cronbach's Alpha*	*Test–Retest*[a] *r*	*1*	*2*	*3*	*4*	*5*
1. Confidence	5.12	1.24	−.72	.22	.86	.81*					
2. Automaticity	4.03	1.38	−.13	−.39	.85	.82*	.19*				
3. Cognitive and emotional control	4.54	1.27	−.27	−.27	.78	.83*	.63*	.22*			
4. Attention	5.51	1.27	−.80	.54	.85	.81*	.68*	.19*	.60*		
5. Effort	5.47	1.10	−.90	.79	.86	.88*	.74*	.20*	.55*	.76*	
Social desirability[b]							−.01	.01	.10	.19*	.19*

Note. Standard error for skewness, .13; kurtosis, .25.
[a] $n = 44$, [b] $n = 239$.
*$p < .01$.

ST can be a particularly conscious cognitive strategy cannot preclude the possibility that it can be used to trigger automatic execution. According to Kanfer (1996), self-regulatory processes are characterized by predominantly controlled processing of information, and components of self-regulation can themselves be learned to the point where they become routinely or automatically processed. Landin and Hebert (1999) after conducting an ST intervention program with skilled volleyball players, speculated, based on athletes' reports, that the use of particular ST cues can serve as a stimulus to initiate an entire movement sequence. Therefore, the automaticity dimension was considered, along with the other most broadly-identified ST functions.

Following item selection based on empirical evidence and raw data themes, a series of exploratory factor analyses were conducted, which supported a 5-factor solution. The identified ST functions referred to improving attentional focus, regulating effort, increasing confidence, controlling cognitive and emotional reactions, and triggering automatic execution. Examination of descriptive statistics indicated that participants scored higher on effort and attention, followed by confidence, cognitive and emotional control, and automaticity. Correlations between the subscales ranged from low to high. In particular, higher correlations were found between confidence, effort and attention, and cognitive and emotional control. Correlations for automaticity were low. In summary, the results of the first study provided evidence regarding the factor structure and the internal consistency of the questionnaire and indicated that athletes' ST mostly serves to regulate effort, control attention, and build confidence. These results resemble preliminary findings from Van Raalte et al. (1994) who reported that junior tennis players were mostly using ST for self-motivation reasons, and from Johnson et al. (2004) who reported that female youth soccer players thought that ST helped them increase confidence and focus attention.

The purpose of the second study was to confirm the factor structure of the instrument, which was identified in the previous study, and give further preliminary descriptive evidence. CFA revealed satisfactory fit indices for the hypothesized 5-factor model, thus supporting the multidimensional approach to the way ST functions and providing psychometric evidence for the factorial validity of the instrument. Descriptive statistics, Cronbach's alphas, and correlations were impressively similar to the ones from the first study, thus enhancing our confidence regarding the integrity of the scale. Correlations between social desirability and the 'effort,' 'attention' dimensions were significant ($p < .01$); however, they were of low magnitude, suggesting that there were no considerable social-desirability effects.

Considering the extensive use of ST in mental-skills programs, the development of a framework regarding the way ST functions appears particularly important. Overall, the results of the present study suggest that categorizing ST as positive or negative, instructional or motivational, with regard to its function

may be too narrow and limited. Hatzigeorgiadis et al. (2004) stressed the importance of appropriately matching ST to the requirements of the task. They argued that the relative significance of the task element, highlighted by ST, to performance is crucial in determining how effective the use of ST can be for each task. Furthermore, the needs of the individual should be carefully considered for the selection of appropriate ST. Therefore, identifying the way ST functions is crucial for developing effective ST plans. The current study supports the multidimensional nature of ST functions and provides a promising framework for the conceptualization of ST.

The present instrument was based on athletes' perceptions regarding the functions of ST. To further support the findings of this investigation, experimental studies assessing effects of ST strategies on the identified functions are sought. Such evidence regarding the construct validity of the instrument has been already provided in two experimental studies. Hatzigeorgiadis (2006) examined perceived functions of ST using the FSTQ in an experimental task. Participants, after receiving a 3-day training on ST, were asked to report their perceptions of ST functions when using a technical instruction and a motivational ST cue during the execution of the task. The results revealed that the motivational ST cue was reported as having a greater effect on participant's effort than the technical instruction ST cue. Further evidence regarding the validity of the instrument is provided by Hatzigeorgiadis, Zourbanos, and Theodorakis (2007). Participants performed an experimental task and were asked to complete a questionnaire assessing levels of confidence, automaticity, effort, anxiety, and concentration (functions-check questionnaire). Following a 3-day ST training program, participants repeated the task using an attentional and an anxiety-control ST cue, and again completed the functions-check questionnaire and the FSTQ. Results from the FSTQ regarding perceived functions of ST were in accordance with changes in the functions-check questionnaire, obtained when not using and when using ST. Furthermore, it was revealed that when using anxiety-control ST cue, scores on the respective FSTQ function were higher than when using an attentional ST cue. The above results provide additional support regarding the psychometric integrity of the FSTQ.

The results of the present investigation suggest that ST can serve multiple functions. That certain functions were correlated indicates that that they are not always independent from each other; that is, different cues can serve different functions, but also that one cue can serve different functions. The confidence and effort functions were strongly correlated, still formed separate factors. These two functions seem conceptually close. According to the process model of self-regulation (Carver & Scheier, 1988), confident individuals may invest more resources to attain their goals because they believe they can attain their goals, and reversely investing greater effort may increase individuals' confidence that their goal can be attained. Thus, using cue words to enhance confidence can

be related to increasing effort, and using cues to increase effort can be related to raising confidence. Attention was strongly related to confidence, effort, and cognitive and emotional control. Results from Hatzigeorgiadis et al. (2004, 2007) have shown that the use of ST has an important impact on the reduction of unwanted–interfering thoughts, irrespective of ST content, and that may explain why increases in the attentional function occur at most instances with the use of ST cues, as ST prevents the occurrence of interfering thoughts by keeping athletes attention to the task at hand. The results of the above-presented experiments support this position as it was shown that different cues can serve different functions, but that the degree to which each function is activated may depend on the specifics of the utilized cues. In practical terms, the findings suggest that coaches and athletes should first identify what the mechanisms are activated through the use of specific cues and, subsequently, based on the needs of the athlete, they should carefully select and practice ST plans to address these needs.

According to the results of the present study, ST can serve to focus attention, regulate effort, enhance confidence, control cognitive and emotional reactions, or trigger automatic execution. Further experimental research can examine types of ST in relation to these ST functions, that is, the degree to which particular ST cues serve different functions, but also differences between several ST cues on each of the identified functions. Furthermore, the effectiveness of ST in relation to ST functions can be assessed in association to task requirements in order to identify ST types that are mostly appropriate depending on task characteristics. Finally, considering that the present instrument did not discriminate between ST used in training and competition, further research could examine whether athletes use ST to achieve different outcomes in training and competition.

ST has been documented as an effective mental strategy. Nevertheless, the development of effective ST plans depends on careful consideration of the requirements of the tasks and the needs of the individual. The assessment of the way ST functions is valuable in developing effective ST plans in relation to these features. Overall, the FSTQ seems to be a valuable instrument, which can help advance our understanding regarding the way ST functions and provide a useful framework for developing effective ST strategies.

REFERENCES

Bandura, A. (1997). *Self-efficacy, the exercise of control*. New York: Freeman.

Bentler, P. M. (1995). *EQS: Structural equation program manual*. Encino, CA: Multivariate Software.

Carver, C. S., & Scheier, M. F. (1988). A control-process perspective on anxiety. *Anxiety Research*, *1*, 17–22.

Conroy, D., & Metzler, D. E. (2004). Patterns of self-talk associated with different forms of competitive anxiety. *Journal of Sport and Exercise Psychology*, *26*, 69–89.

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology*, *24*, 349–354.

Dagrou, E., Gauvin, L., & Halliwell, W. (1991). La preparation mentale des athletes Ivoiriens: Pratiques courantes de perspectives de recherche [Mental preparation of Ivory Coast athletes: Current practice and research perspective]. *International Journal of Sport Psychology*, *22*, 15–34.

Easterbrook, J. A. (1959). The effect of emotion on cue utilisation and the organisation of behavior. *Psychological Review*, *66*, 183–201.

Ellis, A. (1994). The sport of avoiding sports and exercise: A rational emotive behavior therapy perspective. *The Sport Psychologist*, *8*, 248–261.

Finn, J. A. (1985). Competitive excellence: It's a matter of mind and body. *The Physician and Sportmedicine*, *13*, 61–75.

Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessments instruments. *Psychological Assessment*, *7*, 286–299.

Gould, D., Eklund, R. C., & Jackson, S. A. (1992).1988 U.S. Olympic wrestling excellence: II. Thoughts and affect occurring during competition. *The Sport Psychologist*, *6*, 383–402.

Gould, D., Tammen, V., Murphy, S., & May, J. (1989). An examination of U.S. Olympic sport psychology consultants and the services they provide. *The Sport Psychologist*, *3*, 300–312.

Hackfort, D., & Schwenkmezger, P. (1993). Anxiety. In R. N. Singer, M. Murphy, & L. K. Tennant (Eds.), *Handbook of research on sport psychology* (pp. 328–364). New York: Macmillan.

Hamilton, S. A., & Fremour, W. J. (1985). Cognitive behavioral training for college basket-ball free-throw performance. *Cognitive Therapy and Research*, *9*, 479–483.

Hanton, S., & Jones, G. (1999). The effects of a multimodal intervention program on performers: II. Training the butterflies to fly in formation. *The Sport Psychologist*, *13*, 22–41.

Hardy, J. (2006). Speaking clearly: A critical review of the self-talk literature. *Psychology of Sport & Exercise*, *7*, 81–97.

Hardy, J., Gammage, K., & Hall, C. R. (2001). A descriptive study of athletes self-talk. *The Sport Psychologist*, *15*, 306–318.

Hardy, J., Hall, C. R., Gibbs, C., & Greenslade, C. (2005). Self-talk and gross motor skill performance: An experimental approach. *Athletic Insight*, *7*(2). Available: http://www.athleticinsight.comvol7iss2/selftalkperformance.htm

Hardy, J., Hall, C. R., & Hardy, L. (2005). Quantifying self-talk. *Journal of Sports Sciences*, *23*, 905–917.

Hardy, L., Jones, G., & Gould, D. (1996). *Understanding psychological preparation for sport: Theory and practice*. Chichester, UK: Jones Wiley & Sons.

Hatzigeorgiadis, A. (2006). Instructional and motivational self-talk: An investigation on perceived self-talk functions. *Hellenic Journal of Psychology*, *3*, 164–175.

Hatzigeorgiadis, A., Theodorakis, Y., & Zourbanos, N. (2004). Self-talk in the swimming pool: The effects of ST on thought content and performance on water-polo tasks. *Journal of Applied Sport Psychology*, *16*, 138–150.

Hatzigeorgiadis, A., Zourbanos, N., & Theodorakis, Y. (2007). An examination on the moderating effects of self-talk content on self-talk functions. *Journal of Applied Sport Psychology*, *19*, 241–250.

Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research. *Educational and Psychological Measurement*, *66*, 393–416.

***Highlen, P. S., & Bennett, B. B. (1983). Elite divers and wrestlers: A comparison between open and closed skill athletes. *Journal of Sport Psychology*, *1*, 390–409.

Hoyle, R. H., & Panter, A. T. (1995). Writing about structural equation models. In R. H. Hoyle (Ed.), *Structural equation modelling: Concepts, issues, and applications* (pp. 158–176). London: Sage.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modelling*, *6*, 1–55.

Johnson, J. J. M., Hrycaiko, D. W., Johnson, G. V., & Hallas, J. M. (2004). Self-talk and female youth soccer performance. *The Sport Psychologist*, *18*, 44–59.

Johnson-O'Connor, E. J., & Kirschenbaum, D. S. (1982). Something succeeds like success: Positive self-monitoring for unskilled golfers. *Cognitive Therapy and Research*, *10*, 123–136.

Kanfer, F. (1996). Motivation and emotion in behavior therapy. In K. S. Dobson & K. Craig (Eds.), *Advances in cognitive-behavioral therapy* (pp. 1–30). London: Sage.

Kline, P. (1994). *An easy guide to factor analysis*. London: Routledge.

Landin, D. (1994). The role of verbal cues in skill learning. *Quest*, *46*, 299–313.

Landin, D., & Hebert, E. P. (1999). The influence of self-talk on the performance of skilled female tennis players. *Journal of Applied Sport Psychology*, *11*, 263–282.

Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research*, *35*, 465–472.

Mallett, C. J., & Hanrahan, S. J. (1997). Race modeling: An effective cognitive strategy for the 100m sprinter? *The Sport Psychologist*, *11*, 72–85.

Meichenbaum, D. H. (1977). *Cognitive behavior modification: An integrative approach*. New York: Plenum.

Moran, A. P. (1996). *The psychology of concentration in sport performers*. East Sussex, UK: Psychology Press.

Nideffer, R. N. (1993). Attention control training. In R. N. Singer, M. Murphey, & L. K. Tennant (Eds.), *Handbook of research on sport psychology* (pp. 127–170). New York: Macmillan.

Paivio, A. (1985). Cognitive and motivational functions of imagery in human performance. *Canadian Journal of Applied Sport Sciences*, *10*, 22–28.

Perkos, S., Theodorakis, Y., & Chroni, S. (2002). Enhancing performance and skill acquisition in novice basketball players with instructional self-talk. *The Sport Psychologist*, *16*, 368–383.

Rotella, R. J., Gansneder, B., Ojala, D., & Billings, J. (1980). Cognitions and coping strategies of elite skiers: An exploratory study on young developing athletes. *Journal of Sport Psychology*, *2*, 350–354.

Rushall, B. S., Hall, M., Roux, L., Sasseville, J., & Rushall, A. C. (1988). Effects of three types of thought content instructions on skiing performance. *The Sport Psychologist*, *2*, 283–297.

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (3rd ed.). New York: Harper Collins.

Thelwell, R. C., & Greenlees, I. A. (2003). Developing competitive endurance performance using mental skills training. *The Sport Psychologist*, *17*, 318–337.

Thelwell, R. C., & Maynard, I. W. (2003). The effects of a mental skills package on 'repeatable good performance' in cricketers. *Psychology of Sport and Exercise*, *4*, 377–396.

Theodorakis, Y., Chroni, S., Laparidis, K., Bebetsos, V., & Douma, I. (2001). Self-talk in a basketball shooting task. *Perceptual and Motor Skills*, *92*, 309–315.

Theodorakis, Y., Weinberg, R., Natsis P., Douma, E., & Kazakas, P. (2000). The effects of motivational versus instructional self-talk on improving motor performance. *The Sport Psychologist*, *14*, 253–272.

Thomas, P. R., Murphy, S. M., and Hardy, L. (1999). Test of performance strategies: Development and preliminary validation of a comprehensive measure of athletes' psychological skills. *Journal of Sports Sciences*, *17*, 697–711.

Van Raalte, J. L., Brewer, B. W., Lewis, B. P., Linder, D. E., Wildman, G., & Kozimor, J. (1995). Cork! The effects of positive and negative self-talk on dart performance. *Journal of Sport Behavior*, *3*, 50–57.

Van Raalte, J. L., Brewer, B. W., Rivera, P. M., & Petitpas, A. J. (1994). The relationship between observable self-talk and competitive junior players' match performances. *Journal of Sport and Exercise Psychology*, *16*, 400–415.

Van Raalte, J. L., Cornelius, A. E., Brewer, B. W., & Hatten, S. J. (2000). The antecedents and consequences of self-talk in competitive tennis. *Journal of Sport and Exercise Psychology*, *22*, 345–356.

Weinberg, R. S., Smith, J., Jackson, A., & Gould, D. (1984). Effect of association, dissociation, and positive self-talk on endurance performance. *Canadian Journal of Applied Sport Sciences*, *9*, 25–32.

Zinsser, N., Bunker, L., & Williams, J. M. (2001). Cognitive techniques for building confidence and enhancing performance. In J. M. Williams, (Ed.), *Applied sport psychology: Personal growth to peak performance* (4th ed.; pp. 284–311). Mountain View, CA: Mayfield.