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PhD Dissertation

SELF-TALK MECHANISMS IN SPORT: ATTENTIONAL PERSPECTIVES

by

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Krommidas, C., **Galanis, E.,** Papaioannou, A., Tzioumakis, Y., Zourbanos, N., Keramidas, P., & Digelidis, N. (2016). The relationship of empowering and disempowering coaching climate with enjoyment and quality of life variables in Greek youth soccer. *Inquiries in Sport & Physical Education, 14,* 19-35.

Krommidas, C., Keramidas, P., **Galanis, E.,** Papaioannou, A., Digelidis, N., Tzioumakis, Y., & Zourbanos, N. (2015). Physical activity, body mass index and aerobic capacity of youth soccer player: Results from 1st trial of PAPA project in Greece. *Inquiries in Sport & Physical Education, 13,* 115-133.

Krommidas, C., **Galanis, E.,** Papaioannou, A., Zourbanos, N., Tzioumakis, Y., & Digelidis, N. (2015). Objectively measured physical activity levels and body mass index of secondary school students in central Greece: Differences between sex and age. *Inquiries in Sport & Physical Education, 13,* 42-60.

Hatzigeorgiadis, A., **Galanis, E.,** Zourbanos, N., & Theodorakis, Y. (2014). A self-talk intervention for competitive sport performance. *Journal of Applied Sport Psychology, 26,* 82-95.

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General abstract

Evangelos Galanis: Self-talk mechanisms

(Under the supervision of Dr. Antonis Hatzigeorgiadis)

Self-talk interventions in sport have been receiving increased research attention in recent years. The findings have provided robust support that self-talk strategies enhance sport performance. Identifying the mechanisms underlying the effectiveness of self-talk strategies is now among the top priorities for a comprehensive understanding of the self-talk phenomenon. Overall, the purpose of the present research was to forward the literature through the investigation of potential mechanisms that explain the facilitating effects of self-talk on performance. Towards this direction three studies were conducted. The first study is a systematic review that aims at providing an overview of the existing literature and guidance for further research developments on the self-talk mechanisms. Additionally, a prospective model of self-talk mechanisms in sport is introduced. The second study focuses on attentional mechanisms and aimed at examining the effects of self-talk strategies on different attention functions, namely, alertness, vigilance, focused, selective, divided, and spatial attention. To accomplish this purpose six separate experiments testing the effects of self-talk interventions on attention functions were conducted, using the Vienna Test System an instrument assessing neuropsychological functioning. The results showed that in all experiments the experimental groups displayed superior attentional performance compared to the control groups; a meta-analytic synthesis of the results showed a large effect size. Finally, the third study explored the effectiveness of self-talk strategies on task performance under conditions of external distraction. Two experiments in different setting were conducted: a lab experiment,

where particpants were tested on a computer game following a short training period, and a field experiment, where basketball players were tested on free throw shooting, following a six-week intervention. The results showed that in both experiments participants using self-talk performed better than control participants, thus suggesting that self-talk can help countering the detrimental effects of external distractions on performance. Overall, the present investigation provides a working framework for the study of self-talk mechanisms and valuable empirical evidence regarding the attentional effects of self-talk as a key factor explaining the effectiveness of self-talk interventions. The present evidence provides exciting prospect for future research on self-talk mechanisms and the understanding of the self-talk phenomenon in general.

CHAPTER 1: GENERAL INTRODUCTION

Human thoughts are one of the most "mysterious" research themes in the history of scientific inquiry. The investigation of the role and power of the human thoughts is evidence of thousand years of work of philosophers, theorists, and researchers (Wiley, 2006). Nevertheless, nowadays, it has been widely acknowledged that the power of thoughts is capable to influence humans' emotions and behaviours in a strong and cosnistent way. Two of the most worldwide recognized leaders indicated the power of the human thoughts within two quotes: "we are what we think" (Buddha) and "whether you think you can or think you can't, you are right" (Henry Ford). Considering the strong interactions between thoughts and emotions/behaviours research has been turned to investigate the role of what people say to themselves. In the literature, this phenomenon has been described with several terms such as self-talk, automatic thoughts, internal dialogue, inner conversation, self-statements, self-verbalizations, sub-vocal speech, and verbal cues (Guerrero, 2005). In the present dissertation, in accordance with the relevant sport literature, the term self-talk was adopted.

In the society of psychology, the cognitive aspects of self-talk has captured the interest of a broad range of disciplines including neuroscience (Longe et al., 2010), developmental (Fernyhough & Fradley, 2005), educational (Burnett, 1996), social (Hart & Albarracin, 2009), clinical (Kendall & Hollon, 1989) as well as a sport psychology (Hardy, 2006). One of the reasons why self-talk has attracted researchers is perhaps its pervasive use by humans. For instance, Winsler, Feder, Way, and Manfra, (2006) agued that nearly all adults (96%) engage in self-talk and its use has been captured in over a quarter of sampled moments (Heavey & Hurlburt, 2008).

Accordingly, within the sport and exercise context, Gammage, Hardy, and Hall (2001) reported that 95% of exercisers endorse their own use of self-talk related to physical activity.

Eventually, self-talk, established as a core component of human being, have been receiving increased research attention in the sport and exercise psychology literature. The present chapter reviews the broader self-talk literature and focuses on the links between self-talk and performance. Definitions, conceptualizations, and research perspectives of self-talk will be presented; factors influencing athletes' self-talk will be reviewed; and the relationship between self-talk and performance will be thoroughly explored. Finally, the specific purposes of the present research will be outlined.

Defining self-talk in sport

Within the range of disciplines where self-talk has been examined numerous terms mentioned above (e.g., automatic thoughts, internal dialogue, inner conversation, self-statements, self-verbalizations) have been used and clearly there is an overlap between these terms. Van Raalte (2010) argued that the importance of being explicit about the terms is not simply an academic exercise; rather, it has applied relevance as it facilitates understanding and clear communication. Inevitably a number of self-talk descriptions and definitions have been presented within the sport self-talk literature.

In early years of self-talk history, several descriptions of the self-talk phenomenon have been proposed, such as "speaking to ourselves, thinking, one of the components of consciousness" (Henschen & Straub, 1995), "internal dialogue to oneself" (Moran, 1996), "what people say to themselves either internally or out-loud"

(Theodorakis, Weinberg, Natsis, Douma, & Kazakas, 2000), and "occurs anytime a person thinks" (Zinsser, Bunker, & Williams, 2006). Hackfort and Schweknmezger (1993, p. 335), in a more inclusive description, defined self-talk as "an internal dialogue in which the individuals interpret feelings and perceptions, regulate and change evaluations and cognitions and give themselves instructions and reinforcement". Finally, Hardy (2006, p. 84) provided a more comprehensive definition of self-talk suggesting that self-talk should be viewed as "verbalizations or statements addressed to the self; multidimensional in nature; having interpretive elements associated with the content of statements employed; is somewhat dynamic; and serving at least two functions; instructional and motivational for the athlete". In addition, Zourbanos, Hatzigeorgiadis, Tsiakaras, Chroni, and Theodorakis (2010, p. 782), taking into consideration the social influences (e.g., coaching behavior) on self-talk, added to the above definition that self-talk can be "malleable to information and stimuli received from the social environment".

Recently, considering the progress of research on self-talk literature, Hatzigeorgiadis, Zourbanos, Latinjak, and Theodorakis (2014, p. 372) described self-talk as "what people say to themselves either silently or aloud, inherently or strategically, to stimulate, direct, react and evaluate events and actions", whereas Hardy and Zourbanos (2016, p. 450) defined self-talk as "statements, phrases or cue words that are addressed to the self which might be said automatically or very strategically, either out loud or silently, phrased positively or negatively, having an instructional or motivational purpose, an element of interpretation, and incorporating some of the same grammatical features associated with every day speech".

Finally, Latinjak, Hatzigeorgiadis, Comoutos, and Hardy (submitted, p.30) taking into consideration all the previous definitions and also, the current self-talk

research evidences, tried to formulate an integrated definition of self-talk. They defined self-talk as statements or verbalizations characterized by: (a) with interpretative elements associated to their content, (b) addressed, to some degree audibly or covertly, to the self, which include (c) spontaneous statements, reflective of diverse psychological processes, as well as goal-directed instructions, targeting aimed to a wide range of cognitive, emotional, and motivational self-regulatory functions, and (d) specific cue words used strategically for motivational or instructional purposes. Additionally, it should be kept in mind that (e) self-talk is an emergent concept partly overlapping with other emergent constructs, such as thoughts or emotions.

Taking into consideration that one of the key issues in social sciences is the manner in which constructs are defined, numerous research attempts have been made during the last two decades to describe the underling dimensions of self-talk. Firstly, a simplistic distinction between positive (e.g., I can) and negative (e.g., I cannot) self-talk was made. Self-talk has been described as positive or negative depending on the content, but also depending on the impact it may have. The first distinction was a result of the first self-talk studies investigating spontaneous or automatic thoughts that individuals experience. Later on, a distinction between instructional and motivational self-talk was made based on self-talk studies investigating self-talk as a mental strategy with the use of specific cues. Instructional self-talk refers to focusing or directing attention cues, and cues providing instruction with regard to technique, strategy, or kinesthetic attributes of a skill, whereas motivational self-talk refer to "psyching-up" and confidence building cues. The description of self-talk as instructional or motivational is generally based on the content, but has also been based on the function of self-talk.

Hardy (2006) stressed the importance of differentiating the content and the outcome of self-talk. It has been generally endorsed that negative self-talk is associated with negative outcomes, whereas positive self-talk is associated with positive outcomes and performance. Nonetheless, it is not always the case, as negative self-talk can have a positive effect and positive self-talk can have a negative effect. Therefore, the content of self-talk should be viewed as a separate dimension from the outcome of self-talk. With regard to the outcome, self-talk can be regarded as facilitating when having desirable effects and enhancing performance or debilitating when having detrimental effects and hurts performance.

Self-talk models in sport

It has been argued that a better understanding of the factors that shape and affect athletes' self-talk is essential (Zourbanos, Hatzigeorgiadis, & Theodorakis, 2007). Despite the limited number of studies investigating factors that may influence athletes' self-talk, Hardy, Oliver, and Tod (2009) attempted to provide a working framework for the study of self-talk (Figure 1.1.), and, based on the existing research evidence, suggested two clusters of antecedents: personal (cognitive processing preferences, belief in self-talk, personality traits) and situational (task difficulties, match circumstances, coaching behavior, competitive setting); and four possible underpinning mechanisms that explain self-talk – performance relationship: cognitive (concentration, attention), motivational (self-confidence, motivation), behavioural (technique), and affective (affect, anxiety).

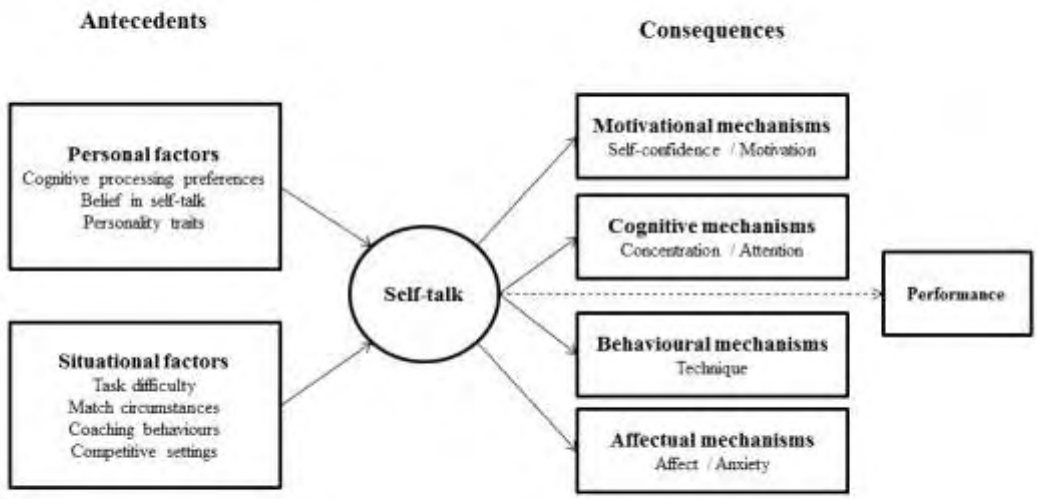

Figure 1.1. *A framework for the study of self-talk (adapted from Hardy, Oliver, & Tod, 2009).*

Recently, VanRaalte, Vincent, and Brewer (2016) adapted Kahneman's (2011) dual-processing theory to explain self-talk as used in sport. The sport-specific model of self-talk (Figure 1.2.) highlights the dynamic among: (a) personal factors; (b) situational factors (referred to as contextual factors in this model); (c) cognitive mechanisms (represented by System 2); (d) affect, motivation, and anxiety related to both Systems 1 and 2; (e) behaviour; and (f) self-talk. Specifically, the System 1 refers to processing generates associations and impressions, is automatic, fast, parallel, effortless, difficult to modify, and occurs below the level of awareness via biases and heuristics, whereas the System 2 refers to the processing of information that occurs in a slow, effortful, and consciously monitored fashion (Kahneman, 2003). The self-talk models are more elaborately addressed in later sections.

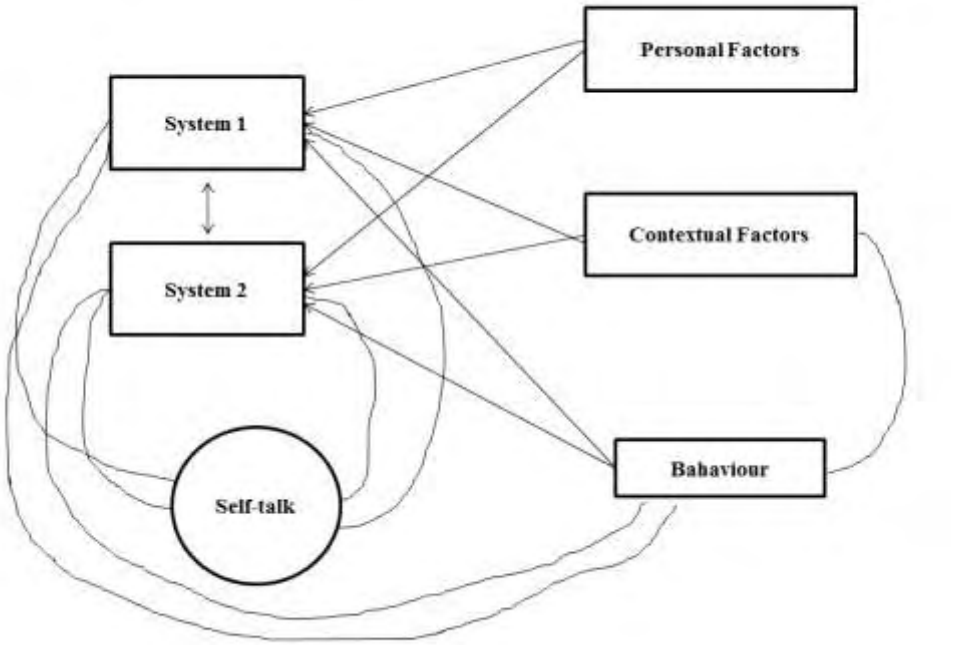

Figure 1.2. *Sport-specific model of self-talk. The antecedents of self-talk, personal and contextual factors, are shown by the black and orange arrows connecting to System 1 and 2. The red arrows represent the connections between System 1, System 2, self-talk, and behaviour; and the reciprocal nature of the links are shown by green and blue arrows. The effect of behaviour on self-talk is mediated through System 1, System 2, and contextual factors. Examples of these connections are described in the text. (adapted from Van Raalte, Vincent, & Brewer, 2016).*

Research perspectives

Although the self-talk research history in sport has been started many decades ago, only the recent years research has become more systematic (Hardy et al., 2009; Hatzigeorgiadis, Galanis, Zourbanos, & Theodorakis, 2014; Latinjak, Zourbanos, Lopez-Ros, & Hatzigeorgiadis, 2014). To date, two conceptual perspectives with

regard to understanding self-talk have been identified. The first line of research refers to self-talk as inherent thoughts and self-statements that athletes address to themselves, mostly during sport performance. This perspective mainly focuses on the occurrence and the frequency of such statements or automatic thoughts, which may occur with or without conscious awareness, inherently or deliberately, and have been mostly used in field studies, descriptive or correlational, to describe the content of athletes' self-talk, to explore self-talk antecedents, and to examine the relationship between self-talk and performance. The second line of research refers to the use of self-talk as a mental strategy, in which self-talk cues or self-talk plans are used with the aim of enhancing performance or achieving other related outcomes. This perspective has been scantly used in descriptive studies exploring the use of self-talk strategies by athletes, and mostly in experimental studies investigating the effects of self-talk as a strategy on task and sport performance. In resume it can be suggested that self-talk can be conceptualized as a thought process specific to athletes (automatic self-talk) or as a condition embedded within intervention studies (strategic self-talk) (Latinjak et al., submitted).

Automatic self-talk

Automatic self-talk refers to inherent statements that athletes address to themselves mostly while performing, but also prior to or after participation in their sport (Hardy, Hall, & Hardy, 2004); these can vary on continuums from less to more conscious, and from less to more intentional (Latinjak et al., 2014). From Van Raalte et al. (2016) perspective, automatic self-talk can be either intuitive or rational. Latinjak et al. (2014) identified that automatic self-talk in sport can be classified into goal-directed and spontaneous types. Goal-directed self-talk is rational, whereas

spontaneous self-talk is intuitive in terms of cognitive processing (for clarification of the overlaps between conceptualizations in between the two theoretical approaches, see Figure 1.3.). Importantly, Latinjak et al. (2017) discriminated between data-driven and theory-driven conceptualizations and suggested that spontaneous self-talk is categorized into subtypes based on its content, whereas goal-directed self-talk is categorized based on its functions.

Data-driven conceptualizations. In sport contexts, athletes have an abundance of self-talk when training or competing. Taking a glance through self-talk literature and focusing on self-talk content, nowadays, self-talk can be divided into two categories: (a) valence, that is, positive and negative self-statements, and (b) functions, motivational and instructional self-talk (Gammage et al., 2001; Hardy, Gammage, & Hall, 2001). According to the content perspective, positive self-talk (e.g., I can do it) in sport refers to encouragement or talk that one could be successful, and defined as self-talk that helps the athlete's keep his/her focus of attention in the present, not on past errors or the distant future (Weinberg, 1988), whereas, on the other hand, negative self-talk (e.g., I can't do it) is self-critical or represents an inability to succeed, and defined as self-talk that gets in the way because it is inappropriate, irrational, counterproductive or anxiety-producing (Theodorakis et al., 2000). Tod, Hardy, and Oliver (2011) summarizing the research evidences suggested that while positive self-talk has a consistent positive effect on performance, there is a null effect of negative self-talk on performance, and only an inconsistent effect on performance when directly comparing positive and negative self-talk.

A slightly differentiated approach to the study of self-talk is reflected on the functions of self-talk (instructional and motivational) as described by Hardy et al. (2001). On one hand, instructional self-talk (e.g., Focus on the ball) reflect statements

that aim at triggering desired actions through proper focus of attention, correct technique, and strategy execution (Hardy, Jones, & Gould, 1996). The conceptualization of instructional self-talk has been further refined into more specific instructional functions; (a) skills-related (e.g., Keep your back straight), and (b) strategy-related (e.g., Go for the open space) instructional self-talk (Hardy et al., 2001). On the other hand, motivational self-talk (e.g., Come on) is describe as self-talk aimed at increasing performance by enhancing confidence, inspiring greater effort and energy expenditure, and creating positive mood (Theodorakis et al., 2000). Motivational self-talk has also been refined into three more specific motivational functions; (a) arousal self-talk (e.g., Let's go) aimed at psyching up, relaxation, and the control of arousal levels, (b) mastery self-talk (e.g., You can do it) aimed at increasing mental toughness, focus, confidence, and mental preparation, and (c) drive self-talk (e.g., Keep trying) aimed at assisting the athlete keep on course to achieve their goals by maintaining or increasing drive and effort levels (Hardy et al., 2001). Overall, the research evidence to date suggests that different self-talk cues may be more or less suitable for different purposes which are leading to three matching hypothesis (a) matching task motor demands to self-talk type, (b) matching learning stage with self-talk type, and (c) matching the setting to type of self-talk. The matching hypotheses will be more elaborately addressed in a later section.

Theory-driven conceptualizations. Several theoretical frameworks had an impact on the taxonomies of automatic self-talk. Importantly, the introduction of thought-processing theories has been crucial for addressing the overlaps between the content and functions of data-driven conceptualizations of self-talk. Latinjak and colleagues (Latinjak et al., 2014; Latinjak, Hatzigeorgiadis, & Zourbanos, 2017) recently modified and adapted Christoff's (2012) theoretical framework, to describe

athletes' goal-directed and spontaneous self-talk. According to Christoff, Gordon, and Smith (2011), goal-directed self-talk, which occurs mostly during reasoning, problem solving, and decision making, includes the representation of current and desired states and develops coordinated actions which attempt to move from the former to the latter (Unterrainer & Owen, 2006). In contrast, spontaneous self-talk consists of unintended, non-working, non-instrumental statements that come to mind unbidden and effortlessly, which are, however, related to the task at hand and relevant contextual stimuli.

Van Raalte et al. (2016) introducing a sport-specific self-talk model adapted Kahneman's (2011) dual-processing theory. They identified (a) an intuitive type of self-talk (also called, System I self-talk) that comes to mind spontaneously and focuses awareness on current experiences, and represents the immediate, emotionally charged reaction to a situation (e.g., Damn it, I messed up); and (b) a rational type of self-talk (e.g., Calm down, it was not entirely your fault) based on reason, which is emotionally neutral (also called, System II self-talk).

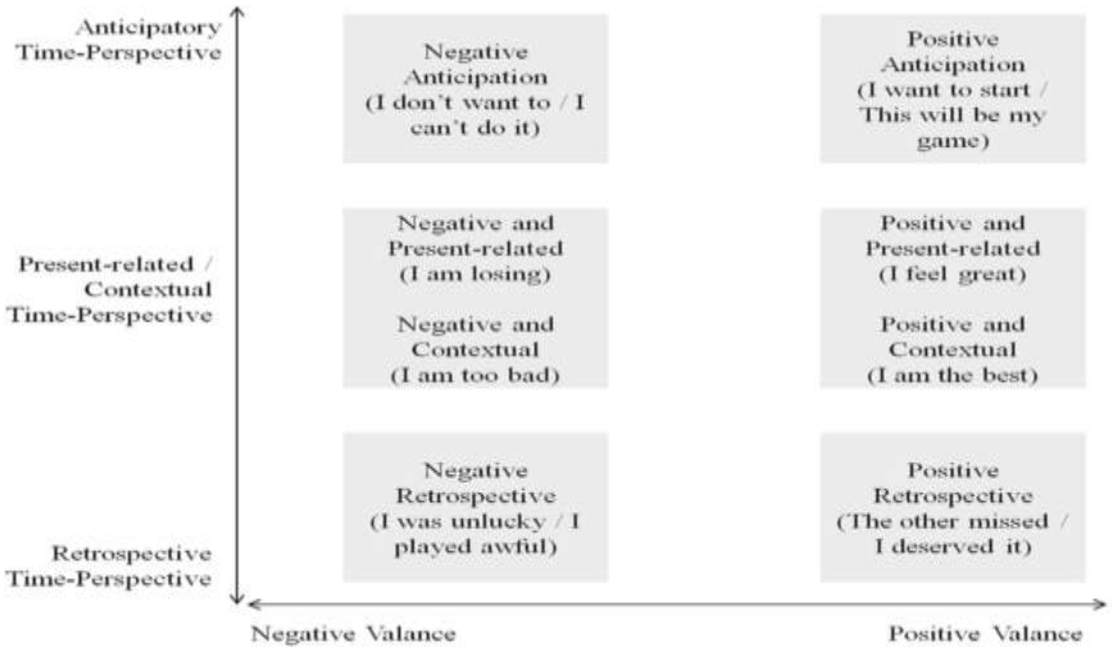

Figure 1.3. *A simplistic representation of spontaneous statements based on two dimensions (valence and time-perspective) and six categories (examples for each category are indicated in parenthesis) (adapted from Latinjak, Zourbanos, Lopez-Ros, & Hatzigeorgiadis, 2014).*

Strategic self-talk

Strategic self-talk refers to the instrumental use of self-talk and involves the use of self-talk cues aimed to facilitate learning and enhance performance, through changes in performance antecedents, such as cognition, motivation, behaviour or affect (Hardy et al., 2009). Strategic self-talk can be considered emotionally neutral, as it is rational in origin and not emotionally driven (Van Raalte et al., 2016), however, it can target emotional outcomes, such as psyching up or relaxation.

The basic goals of self-talk strategies (self-talk cues) are to facilitate learning and enhance performance. Facilitating learning involves acquiring new skills, correcting mistakes, and improving technique, while enhancing performance may involve being in a state of readiness, choosing and applying effective tactics, regulating cognition and emotion, handling stressful situations or coping with adverse and unexpected events (Hatzigeorgiadis, Zourbanos, et al., 2014). Generally, the rationale behind the use of self-talk cues is that athletes provide appropriate instructions or directions for action to themselves and subsequently execute the correct or appropriate action by simply following the self-instructions they have used.

Additionally, according to the function of the cue words, the most frequently self-talk cues used by athletes serve instructional (e.g., Bend your knees) and motivational (e.g., Try harder) purposes. Latinjak, Torregrosa, and Renom (2011)

employed a combination between self-talk and feedback they called self-feedback (e.g., You did well), an aspect of instructional self-talk, and Hatzigeorgiadis, Zourbanos, and Theodorakis (2007) used an anxiety-reducing self-talk (e.g. Calm down), a subtype of motivational self-talk. Furthermore, two other potentially important factors in self-talk interventions are (a) the degree to which cue words are self-determined by the athlete (Hardy, 2006), and (b) the amount of training athletes had with their self-talk (Hatzigeorgiadis, Galanis, et al., 2014).

Self-talk measurement

According to Vygotsky (1962) the study of thoughts/self-talk is among the most difficult of research fields. Various methods used to assess individual's self-talk, such as think-aloud processes, interviews, self-monitoring, thought listing, but the most popular assessment in sport is based on self-reports questionnaires. In accordance with the two research perspectives described above (automatic and strategic self-talk), two broader types of measures have been developed and used: (a), instruments that assess the content and structure of self-talk; and (b), instruments aiming to describe the use and the purpose of self-talk.

With regard to the first type, content, and also the structure and the frequency of athletes' self-talk, Hatzigeorgiadis and Biddle (2000) developed the Thought of Occurrence Questionnaire for Sport (TOQS) assessing three dimensions of cognitive interference: performance worries (e.g., I am not going to achieve my goals today), irrelevant thoughts (e.g., What I am going to do when I get home), and thoughts of escape (e.g., I want to get out of here). More recently, Zourbanos, Hatzigeorgiadis, Chroni, Theodorakis, & Papaioannou (2009) developed the Automatic Self-Talk Questionnaire for Sport (ASTQS), an instrument assessing both positive and negative

self-talk and providing support for the multidimensional nature of athletes' self-talk. Specifically, it comprises by eight (four positive, four negative) distinct dimensions: psych-up (e.g., Let's go), confidence (e.g., I can make it), anxiety control (e.g., Calm down), instruction (e.g., Concentrate), worry (e.g., I am going to lose), disengagement (e.g., I want to stop), somatic fatigue (e.g., I am tired), and irrelevant thoughts (e.g., What I am doing later?).

With regard to the second type, use and purpose of self-talk, Theodorakis, Hatzigeorgiadis, and Chroni (2008) based on empirical evidence and raw data from a large number of athletes developed the Functions of Self-Talk Questionnaire (FSTQ), an instrument that identifies the likely purposes for which athletes may use self-talk. According to the FSTQ dimensions, self-talk can serve to: enhance attentional focus (e.g., Concentrate better to the execution), increase confidence (e.g., Feel more confident for my abilities), regulate effort (e.g., Maintain effort high levels), control cognitive and emotional reactions (e.g., Feel more relaxed), and trigger automatic execution (e.g., Execute as if on an automatic pilot).

An alternative assessment approach has been developed by Van Raalte, Brewer, Rivera, and Petitpas (1994). Attempting to provide a more objective look at athletes' self-talk, they developed the Self-Talk and Gestures Rating Scale (STAGRS). This instrument assesses observable self-talk based on a rating system including three broad self-talk dimensions: positive (e.g., Keep it up), negative (e.g., That was a terrible shot), and instruction (e.g., Hit through the ball). To summarize, the development of assessment inventories in the self-talk area has progressed from simple to more comprehensive. Alternative assessment methodologies, such as observation and video recall, could be employed to further enhance the assessment of athletes' self-talk, but also nowadays, technological innovations could be offer

expanding opportunities to facilitate behaviour modification. In sport contexts lots of parameters are digitized and measured more accurately from fitness level to health indicators (e.g., accelerometry, EEG, fMRI). Murphy (2009) suggested that sport psychology may be a useful framework for studying the interface between technology, competition, and sport.

Factors influencing athletes' self-talk

In self-talk literature, research on the antecedents of self-talk has been relatively sparse (Hardy, 2006; Van Raalte, Cornelius, Brewer, & Hatten, 2000). According to Hardy et al. (2009) this may be due to the absence of an established theoretical grounding of self-talk. Understanding the factors that shape or influence self-talk can facilitate attempts to intervene and change such factors, thus regulating self-talk according to individual needs. Hardy et al. (2009) based on the research evidences attempted to provide a framework for the study of self-talk, suggesting two categories of antecedence, personal and situational factors, which may influence athletes' self-talk.

Personal factors

The personal factors presented in this framework including three sub-categories of personal-level antecedents to athletes' use of self-talk: (a) cognitive processing preferences, (b) belief in self-talk, and (c) personality traits. Individual cognitive processing preferences are drawn from Plavio's (1971) dual coding theory. It has been proposed that each person prefers encoding and processing information either verbally or non-verbally. Hardy et al. (2009) hypothesized that athletes with a strong verbal cognitive processing preference would be likely to use self-talk more

frequently than athletes with a strong non-verbal processing preference. Belief in self-talk is an important issue in studies of interventions in general, suggesting that a belief or expectancy about intervention effectiveness may be a precondition for it to be effective (Oikawa, 2004). Personality traits are the third individual antecedence of self-talk. It has been general supported that more global personality traits might be related to the use of self-talk by athletes (Perry & Marsh, 2000).

Among the potential personal factors that influence self-talk, motivational orientation has received notable attention. In a series of studies, Hatzigeorgiadis and his colleagues examined factors linked to achievement motivation in relation to athletes' negative self-talk (Hatzigeorgiadis & Biddle, 1999; 2000; 2002; Hatzigeorgiadis, 2002). Generally, the results revealed that (a) task orientation was negatively related to disengagement thoughts irrespective of perceptions of competence, (b) for athletes with lower perceived competence, ego orientation was positively related to experiencing disengagement thoughts, whereas for athletes with higher perceived competence, no relationship between ego orientations and disengagement thoughts emerged, (c) athletes with high ego and low task orientations were more vulnerable to disengagement thoughts than were athletes with different goal profiles, and (d) self-consciousness was related to disengagement thoughts and mediated the relationship between ego orientations and disengagement thoughts. Additionally, Harwood, Cumming, and Fletcher (2004) this time including positive self-talk, reported that athletes with higher task and moderate ego orientations reported more positive thinking that did athletes with lower task and moderate ego orientations and athletes with moderate task and lower ego goal orientations. Overall, the results seem to suggest that task orientation is linked to more "adaptive" (at least

in terms of content) self-talk patterns, whereas for ego orientation, relationships with self-talk may depend on other personal or situational factors.

Situational factors

Research on situational factors affecting self-talk in sport has been conducted in relation to match circumstances and competitive settings. Regarding match circumstances have been found to be related to the likelihood of subsequent self-talk, and also influencing self-talk content depending of athletes' success or failure. One of the first studies aiming to investigate how situational factors may influence athlete's self-talk conducted by Van Raalte et al. 2000. From the results revealed that athletes' negative self-talk was evident following lost points or fault serving. Continuing the research on situational factors, Hatzigeorgiadis and Biddle (2008) examined the pre-competition anxiety and the progress of performance. The results revealed (a) that the pre-competition anxiety intensity, and in particular cognitive anxiety, has been positively related to negative self-talk, and mostly performance worries during competition, and (b) a strong relationship between such discrepancies and negative self-talk, suggesting that what is going on during competition to a large degree determines athletes' self-talk, at least negative self-talk.

In relation to competitive setting there seem to be differences in the content of automatic self-talk between training and competition. Hardy, Hall, and Hardy, (2005) reported that athletes tend to use more self-talk during the competition rather than practice. Hardy et al. (2001) reported that athletes reported more frequent self-talk before competition compared to before training, but similar levels of seld-talk during either training or competition. Those athletes reported the extensive use of self-talk in practices makes intuitive sense given practices are the primary venue for both skill

development and preparation for competition. In addition, the finding that self-talk was used to the same extent prior to completion as during the actual competition can be similarly explained by how crucial the time prior to competing is for performance preparation.

Social-Environmental factors

Even though coaching behaviour was describes as part of the situational factors in Hardy et al.'s (2009) model, Theodorakis, Hatzigeorgiadis, and Zourbanos (2012) suggested that coach-related factors should be treated as separate social environmental factors. They argued that sporting environment plays critical role in shaping athletes' self-talk, and coaches are the most important individual in creating the climate in which sport takes place. Thus, the behaviors adopted by the coaches and the way information is communicated can have a significant influence on athletes' self-talk.

Field correlational evidence showed that supportive and negative coaching behavior is linked to different patterns of thought content (Zourbanos et al., 2006; 2007; 2010; 2011). Specifically, Zourbanos and his colleagues have reported that (a) supportive coaching behavior is positively related to positive self-talk and negatively related to negative self-talk, whereas negative behaviors characterized by tension and nerves are related to athletes' negative self-talk, (b) a learning motivational climate, focusing on mastering skills and personal improvement is linked to athletes experiencing more positive and less negative self-talk, whereas a climate that focuses on outperforming others and highlights a winning-at-all-costs attitude has been linked to negative self-talk, and (c) manners, body language, and actual vocalized self-talk of opponents may have an effect on athletes' self-talk.

Self-talk and performance

The most interesting research question in the self-talk literature involves the relationship between self-talk and performance. Taking into consideration the links between cognitions/thoughts and behaviors/actions, sport psychologists attempted to develop self-regulation strategies, such as self-talk. According to Hatzigeorgiadis, Zourbanos, et al. (2014) the self-talk – performance relationship is reciprocal. Namely, on one hand, performance influences self-talk (e.g., progress towards goal during competition), and on the other hand, self-talk influences performance (e.g., talking positively to oneself increase confidence). This section mostly focusing on field and experimental studies that have been examined the self-talk – performance relationship and a meta-analytic review, reporting on the overall effects of self-talk strategies and examining factors influencing the effectiveness of self-talk.

Field studies

Initial attempts to explore the relationship between self-talk and performance have been made in 1970s, the early years of self-talk research. The findings of the first examination of this relationship showed that athletes (gymnasts) who qualified for the Olympic Games reported more positive self-talk in training and in competition, and a similar trend emerged for instructional self-talk (Mahoney & Avener, 1977). In a similar study, few years later, Highlen and Bennett (1983) observed that the athletes (wrestlers) who qualified at the Pan-American championship reported less negative self-talk prior to competition than did those who did not qualify. In contrast, the results of two more studies in those years, showed no differences in self-talk in successful and no successful situation for skiers (Rotella,

Gansneder, Ojala, & Billings, 1980) and football players (Dragou, Gauvin, & Halliwell, 1991).

Two field studies have attempted to relate self-talk with performance through observational assessments. Van Raalte et al. (1994) examined observed overt self-talk and gestures in young tennis players. The results revealed that positive self-talk was not related to better performance, but negative self-talk was associated with worse performance. In contrast, in a similarly study, Van Raalte et al. (2000) with adults tennis players, found that positive and negative self-talk could not significantly predict the outcome of the following point, suggesting that self-talk was not related to performance.

These field studies have not provided consistent results regarding the relationship between athletes' self-talk and performance. Some possible explanations for this inconsistency are (a) the different approaches in the conceptualization of self-talk, (b) the unclear descriptions of how self-talk was assessed and the use of single-item measures, (c) the lack of clarity with regard to assessing self-talk as a strategy or as spontaneous self-talk, (d) the questionable performance criterion including more versus less successful athletes, and game or situational outcomes (win/loss). Nevertheless, these preliminary studies have provided valuable directions for research development.

Experimental studies

Given the focus of sport on performance and subsequently the demand for performance enhancing strategies, the direct applied value of strategic self-talk becomes apparent. Accordingly, the self-talk literature in sport has been dominated by experimental research through self-talk interventions as a means to investigate the

effectiveness of self-talk strategies for improving performance. Reviewing the self-talk literature, Theodorakis et al. (2012) classified self-talk interventions in relation to the characteristics of the settings and the tasks that have been used. There are four levels at which self-talk interventions implemented to athletes can be classified: (a) interventions testing the effectiveness of self-talk on *fundamental motor tasks* in lab or field settings, such as vertical jump (Edwards, Tod, & McGuigan, 2008), and cycling tasks (Hamilton, Scott, & McDougall, 2007); (b) interventions on the effectiveness of self-talk on *performance components* of different sports, such as forehand drive in tennis (Hatzigeorgiadis, Zourbanos, Goltsios, & Theodorakis, 2008); (c) interventions testing self-talk strategies on *sport performance in non-competitive context* (unofficial timings or experimentally induced events), such as middle distance running performance (Weinberg, Miller, & Horn, 2012); (d) interventions investigating the effectiveness of self-talk strategies on *competitive sport performance* (Hatzigeorgiadis, Galanis, et al., 2014).

Fundamental motor tasks. One of the first studies where experimentally examined the effects of self-talk in motor performance conducted by Theodorakis et al. (2000). Specifically, they examined the effectiveness of different self-talk strategies on increasing performance in different motor tasks. To achieving this goal, four laboratory experiments were conducted to examine the effects of motivational and instructional self-talk on four different motor tasks (soccer accuracy test, badminton service test, sit up test, knee extension task on isokinetic dynamometer). The results from the first two experiments indicated that only the instructional self-talk group improved the performance significantly more than the motivational self-talk and control group. The results of the third experiment indicated no significant differences between the three groups. Finally, the results of the fourth experiment

showed a significant improvement for both the instructional and motivational self-talk groups compared to the control group.

Araki et al. (2006) examined (a) the influence of positive and negative self-talk on performance and (b) the relationship between one's belief in self-talk and performance. The sample was 125 undergraduate students that were performed a stabilometer balance task. The results indicated that (a) the students who used positive self-talk performed significant better than the students used negative self-talk and (b) the belief in self-talk was not significant correlated with performance. These results suggested that the type of self-talk used (positive or negative) was more important than one's belief in self-talk.

Edwards et al. (2008) examined the effects of instructional and motivational self-talk on centre of mass displacement and hip kinematics during the vertical jump. The twenty-four male rugby union players engaged in one of three counterbalanced interventions (motivational self-talk, instructional self-talk or no-intervention). The results revealed that motivational and instructional self-talk led to greater hip displacement and greater hip rotation velocity than the no-intervention control. These results in general, indicate that self-talk may influence performance and technique during the vertical jump in male rugby players.

Performance components. Three studies examining the effectiveness of self-talk strategy on performance component date back to 80s. Hamilton and Fremour (1985) assessed the effectiveness of a cognitive-behavioral training program (self-talk strategy) on the free-throw shooting of male college basketball players during intercollegiate completion. The results revealed that the basketball players who used positive self-talk improved their performance in free-throws. The researchers also mentioned that this improvement came from the decrease of negative thoughts (86%)

and replacing those negative thoughts with positive thoughts (71%). Ziegler (1987) examined the effects of stimulus cueing (instructional self-talk) on the acquisition of forehand and backhand returns by beginning tennis players. Specifically, they were used self-talk cues such as “ball”, “hit” or “ready” timed according to the execution of the task to direct players’ attention to the appropriate stimuli. The results showed acceleration in skill acquisition during intervention, with both forehand and backhand returns improving over 45% from baseline conditions. Finally, Rushall, Hall, Roux, Sasseville, and Rushall (1988) examined the effect of thought content instructions on skiing performance, using cues such as “full movement range” to provide guidance, and “feel great” to boost confidence. Performance improvements of more than 3% were registered under each thought content condition, even though all subjects reported that they were not aware of any effort differentiations. Over the next decades, research that followed examined the impact of positive self-statements and self-instructions on task performance. Dragou, Gauvin, and Halliwell (1992) and Van Raalte et al. (1995) in similar studies, examined the effects of positive and negative self-talk on dart throwing performance. The results of these studies revealed that participants were used positive self-talk cues performed better on a dart throwing accuracy task than did participants of control groups.

Theodorakis, Chroni, Laparidis, Bebetsos, and Doume (2001) examined the effectiveness of two different types of self-talk on the performance of a basketball-shooting task. During the experiment, the control group performed with the general instructions, whereas the two self-talk groups used the cue words "relax" and "fast," respectively. Analysis showed that only the participants of the self-talk group who used the word "relax" improved their performance significantly as compared to the other two groups.

Perkos, Theodorakis, and Chroni (2002) examined the effectiveness of instructional self-talk on acquiring and performing three basic basketball skills (dribbling, passing, shooting). The researchers implemented a long time self-talk intervention programme (12 weeks) in young basketball players. The results showed that the experimental group participants performed better than their control group counterparts when dribbling and passing. Furthermore, experimental group participants reported using self-talk more when dribbling and passing and less when shooting.

Hatzigeorgiadis, Theodorakis, and Zourbanos (2004) conducted to experiments to examine the effects of instructional and motivational self-talk on performance on two water-polo tasks with similar characteristics. The first experiment was involving a precision task (throwing a ball at target). The results revealed that both self-talk groups improved their performance in comparison to the baseline measure, with participants using instructional self-talk improving more. The second experiment was involving a power task (throwing a ball for distance). The results revealed that only the motivational self-talk group improved its performance significantly.

Goudas, Hatzidimitriou, and Kikidi (2006) conducted two studies in order to examine the effectiveness of three types of self-talk (instructional, motivational, kinesthetic) on sport performance. In the first study, shot put amateur athletes took place. The results showed that all three types of self-talk improved club representative athletes' shot put performance relative to the baseline trial. Furthermore, in the second study, physical education students took place. The results of a long jump measurements showed that participants did not improve significantly their long jump

performance using self-talk. However, the results of these studies, kinesthetic self-talk could be effective in sport tasks.

Hamilton et al. (2007) examined the effectiveness of three different self-talk interventions (self-regulated positive self-talk, assisted positive self-talk, and assisted negative self-talk) on endurance performance. Participants were nine cyclists who performed a 20-minute cycling ergometer workout two times per week for five weeks. At each workout participants were requested to cycle as far as possible. Results revealed a performance increase in all groups with the greatest increase being found in the assisted positive self-talk condition.

Hatzigeorgiadis et al. (2008) examined the effects of motivational self-talk on self-efficacy and task performance (forehand drive). The experiment was completed in five sessions. In the first session, participants performed a forehand drive task. Subsequently, they were divided into an experimental and a control group. Both groups followed the same training protocol for three sessions, with the experimental group practicing self-talk. In the final session, participants repeated the forehand drive task, with participants in the experimental group using motivational self-talk. The results showed that self-efficacy and performance of the experimental group increased significantly, whereas self-efficacy and performance of the control group had no significant changes. Furthermore, from the results observed that increases in self-efficacy were positively related to increases in performance.

In a similar study, Hatzigeorgiadis, Zourbanos, Mpoumpaki, and Theodorakis (2009) examined the effects of motivational self-talk on self-confidence, anxiety, and task performance in young tennis athletes. A forehand drive test was used to evaluate task performance. The results revealed that task performance improved for the experimental group and remained stable for the control group; self-confidence

increased and cognitive anxiety decreased for the experimental group, whereas no changes were observed for the control group. Correlation analysis revealed that changes in task performance were moderately related to changes in self-confidence.

Sport performance in non-competitive context. Despite the increasing volume of research in self-talk, research for comprehensive sport performance has been very sparse. Many years ago, Mallett and Hanrahan (1997) made the first attempt to examine the effects of self-talk strategies have on sport performance in non-competitive settings. Specifically, they investigated the effects of a specific race plan (self-talk plan corresponding at the different parts of the sprint) on 100m sprint performance of twelve elite athletes. The results showed that participants improved their times by approximately 2.3%, which was evaluated as a considerable improvement for that level of athletes.

Malouff and Murphy (2006) examined whether using self-instructions would improve golf performance in recreational golfers. A hundred adult golfers participated in the study that completed in a putting tournament. Participants of the intervention group were asked to give themselves a self-instruction of their choice (e.g., Body still), before each putt. The self-instruction golfers needed significantly fewer putts than the golfers in the control condition to complete 12 holes. Additionally, the self-instruction golfers as a group reported that they thought they were putting better than normal, while the golfers in the control condition thought they were putting at about their usual level of performance. In a similar study with golfers and the opportunity they had to select self-talk cues, Harvey, Van Raalte, and Brewer (2002) examined the effects of instructional, positive, and negative self-talk in golf performance. The results revealed that the instructional self-talk group had better performance rather than the positive self-talk, negative self-talk, and control group.

More recently, Weinberg et al. (2012) examined the effectiveness of different types of self-talk (instructional, motivational, combined) and the self-determined nature of the self-talk (assigned vs. freely chosen) on one-mile run performance. Collegiate cross-country runners were assigned to one of six intervention groups after completing a baseline one-mile time trial. A week later they completed the test trial using their specific intervention technique. In general, their results showed that a self-talk intervention based on the use of recorded instructions improved performance from pre- to post-intervention over a week. In these studies performance was assessed in conditions or events organized by the researchers.

Competitive sport performance. Field experiments in competitive situations are sparse due to the methological limitations that characterize such attempts, but also due to the difficulty of access to athletes during competitive period sand events. Schuler and Langens (2007) tested the use of self-talk strategies as a means for buffering against the negative effects of psychological crisis that occur during a marathon race in non-professional runners. They reported that among runners who experienced a large psychological crisis, those using self-talk coped better than those in a control group. Participants in this study did not receive any training with regard to the use of self-talk. They were asked to create their own self-talk cues and use them at the point at which the psychological barrier of "the wall" appears in marathon runners. In addition, this study was partly based on retrospective self-reports obtained after the race. Nevertheless, this study provided useful preliminary evidence regarding the effectiveness of self-talk on competitive sport performance.

Recently, Hatzigeorgadis, Galanis, et al. (2014) examined the effectiveness of a 10-week self-talk intervention on competitive performance in young swimmers. The performance was recorded on 2 competitive occasions with a 10-week interval. The

self-talk intervention took place in-between of the two officials and equal important competitions with the athletes following for two weeks motivational self-talk plans, two weeks instructional self-talk plan, four weeks mixed self-talk plans, and the final two weeks the athletes developed their own autonomous self-talk plans. They practiced on their own self-talk plans in order to use it to the following competition. The results showed that the intervention group had greater performance improvements than the control group, thus, supporting the effectiveness of the program in enhancing sport performance in a competitive environment. In addition, the findings provide directions for the development of effective self-talk interventions.

Effectiveness of self-talk intervantions - Meta-analysis

Considering the plethora of empirical evidence on the effectiveness of self-talk strategies on performance, Hatzigeorgiadis, Zourbanos, Galanis, and Theodorakis (2011) conducted a meta-analysis to detect the overall effect of self-talk interventions, but also to identify potential moderators that may regulate the effectiveness of such interventions. Based on a thorough review and considering Hardy et al.'s (2009) suggestions, Hatzigeorgiadis et al. (2011) classified potential moderators into four factors based on (a) the participants' characteristics, (b) the tasks used, (c) the specifics of self-talk, and (d) the characteristics of the intervention. With regard to participants' characteristics, self-talk interventions have been implemented in school (Zourbanos, Hatzigeorgiadis, Bardas, & Theodorakis, 2013a) and university (Cutton & Landin, 2007) students, in young (Zetou, Vernadakis, & Bebetsos, 2014) and adults (Edwards et al., 2008), and in beginners (Zielger, 1987) and experienced (Mallett & Hanrahan, 1997) athletes.

Task characteristics. With regard to task characteristics, Hatzigeorgiadis et al. (2011) classified interventions in relation to motor demands and novelty. Regarding motor demands, the distinction was between tasks involving mostly fine motor skills, which require dexterity, hand-eye coordination, precision, and accuracy (e.g., dart throwing, golf-putting, shooting in basketball) and tasks involving mostly gross motor skills, which require physical conditioning, endurance, strength, and power (e.g., cycling, long distance running, long-jump, shot-put). Regarding novelty, the distinction is between novel and well-learned tasks. Several studies have used tasks for which participants have no prior experience (e.g., water-polo tasks in students who have never played water-polo), whereas others have used tasks that are well mastered by participants (e.g., tennis forehand in tennis players).

Self-talk characteristics. With regard to self-talk characteristics interventions were classified in relation tothe content, the source of selection, and the overtness. With regard to the content (type), in accordance with the literature self-talk was categorized as instructional and motivational. With regard to the source of selection, in the literature there is studies where self-talk was assigned to particpants by the researchers (Van Raalte et al., 1995) to ensure that appropriate for the task cues were used by participants, and studies where participants have been encouraged to select from a designated list (Schuler & Langens, 2007), or develop their own self-talk plans (Malouff & Murphy, 2006). Accordingly, interventions were categorized to those with assigned self-talk and those with self-selected self-talk. Studies were initially based on assigned self-talk. Finally, with regard to overtness, self-talk can be internal (covert, silent) or external (overt, out loud). Researchers initially preferred external self-talk to ensure that self-talk cues were actually used (Ming & Martin, 1996). Nevertheless, feedback from participants has shown that some find it awkward and

distracting to use external self-talk (Masciana, Van Raalte, Brewer, Brandon, & Coughlin, 2001), and, therefore, in many subsequent studies participants have been advised to use internal self-talk or have been given the choice between internal and external self-talk (Harvey et al., 2002). Accordingly, interventions were categorized to those where participants were instructed to use either internal or external self-talk, and those where particpants were given a choice between internal and external.

Characteristics of the intervention. In terms of interventions, studies have been carried out using from cross sectional to short (e.g. three to five sessions; Gregersen, Hatzigeorgiadis, Galanis, Comoutos, & Papaioannou, 2017), to more extensive (e.g. eight to twelve weeks; Hatzigeorgiadis, Galanis, et al., 2014) training interventions, whereas in other studies no training on self-talk has been applied (Harvey et al., 2002). In the former, participants had the chance to practice the use of self-talk, whereas in the latter participants received information on the use of self-talk and some familiarization attempts. Accordingly interventions were categorized to those including some form of training and those not including practicing self-talk.

A total of 32 studies yielding 62 effect sizes were included in the final meta-analytic pool. An overall effect size of 0.48 was identified, indicating that self-talk can meaningfully facilitate learning and enhance performance in sport tasks. Furthermore, based on the characteristics identified above the analyses for potential moderators showed that (a) self-talk was more effective for tasks requiring fine skills, such as precision and accuracy, rather than tasks requiring gross skills, such as strength and endurance; (b) self-talk was more effective in novel rather than in well-learned tasks; (c) interventions including training of self-talk were more effective than intervention where no training was implemented; finally, it was revealed that instructional self-talk proved more effective than motivational self-talk for fine tasks;

and moreover, instructional self-talk was more effective for fine tasks compared to gross tasks. In summary, their results provided robust evidence for the effectiveness of self-talk interventions in the sport field.

Matching hypothesis

Contemporary research has attempted to examine and compare the effectiveness of different types of self-talk with different tasks. Theodorakis et al. (2000) introduced the *task motor demands by self-talk type matching hypothesis*. They argued that instructional self-talk should be more beneficial for relatively fine tasks because instructional self-talk may be more effective in regulating attentional processes, and for such task performance can benefit more from increased attention compared to gross tasks. In contrast, they claimed that motivational self-talk should be more beneficial for relatively gross tasks, because motivational self-talk may be more appropriate for psyching-up and maximizing effort, and for such tasks physical effort may be more influential to performance compared to fine tasks.

Hatzigeorgiadis, Zourbanos, et al. (2014) based om contemporary evidence proposed two more matching hypotheses: (a) matching learning stage with self-talk type, and (b) matching the performance setting to type of self-talk. Regarding *learning stage* it was suggested that at the early stages of learning, the use of explicit cues in the form of instructional self-talk can improve concentration, and help them identify and shift attention to the task-relevant stimuli, thus facilitating the learning process. In contrast, at more advance performance stages athletes may benefit more from motivational cues words that refer to psychological and physical activation, the building of confidence and increasing readiness for performance. Thus, instructional self-talk should be more effective for novel tasks, or tasks at the early stages of

learning, whereas motivational self-talk should be more effective for well-learned tasks, or tasks at the automatic stages of performance. Preliminary research evidences in a handball shooting task showed that instructional self-talk was more effective rather than motivational self-talk when participants were performing with the non-dominant arm, whereas a marginal effect in favor of the motivational self-talk emerged for the dominant arm (Zourbanos, Hatzigeorgiadis, Bardas, & Theodorakis, 2013b).

Regarding *performance setting* it was suggested that instructional self-talk should be mostly used in training, whereas motivational self-talk seems more appropriate for the competitive circumstances. As instructional self-talk can be more effective for learning, correcting mistakes, or improving aspects of performance, it seems more appropriate for the practice phase; in contrast, as motivational self-talk can be more effective for increasing readiness and psyching-up, it seems more appropriate for the performance phase. Indirect evidences of performance setting with self-talk type matching hypothesis presented by Hatzigeorgiadis, Galanis, et al., (2014) who noticed that, after a long time intervention self-talk program involving both instructional and motivational self-talk cues, athletes adopted only motivational self-talk cues (with minor exceptions) when they were developing their competition self-talk plans. The evidence supporting the different matching hypotheses provide indications that different types of self-talk are more effective depending on personal and situational characteristics. This conclusion surfaces the idea that difference self-talk cues may operate and be effective through different mechanisms. The literature reviewed above therefore suggests that exploring self-talk mechanisms will greatly help our understanding of the self-talk phenomenon.

Summary and Purpose: Functions/Mechanisms of self-talk

A glance through sport psychology literature reveals that self-talk is one strategy commonly included in mental-skills training programmes and is proposed by sport psychologists to regulate cognitions, emotions, behaviour and performance (Zinsser et al., 2006).

There is now robust evidence based on meta-analytic (Hatzigeorgiadis et al., 2011) and systematic (Tod et al., 2011) reviews that self-talk strategies are effective in enhancing performance and facilitating learning in sport contexts. Nevertheless, the variety of the effects in different settings and populations, has forwarded the need to understand how self-talk works, that is, the mechanisms underlying its effectiveness. Understanding the mechanisms of self-talk is significant because it will help improving interventions and, importantly, adapting interventions to match situational demands and individual needs. Thus, the first purpose of this dissertation was to review systematically all empirical evidence related to potential mechanisms that may explain the effectiveness of self-talk strategies.

Research on self-talk mechanisms has been sparse and non-systematic, however, there is reasonable indications suggesting that the effects of self-talk on attention is a pertinent mechanism explaining the effectiveness of self-talk strategies. Preliminary evidence regarding the attentional effects of self-talk has been offered through athletes' tributes following self-talk interventions, where athletes acknowledged that self-talk strategies helped them improving their concentration and directing their attention efficiently. Further testimonials regarding the beneficial effects of self-talk on attention have been reported in qualitative studies (Wayde & Hanton, 2008; Miles & Neil, 2013) and case studies (Cutton & Hearon, 2014). The

second purpose of the present research was to forward the self-talk literature through experimental investigation of the attentional mechanisms of self-talk.

Overall, the present dissertation includes three separate studies. The first study (Galanis, Hatzigeorgiadis, Zourbanos & Theodorakis, 2016) is a systematic review of the relevant literature in order to retrospect the limited, but valuable research regarding the mechanisms of self-talk, to identify potential implications for practice, and to provide direction for future research. First, a brief summary of the effects of self-talk interventions on sport performance will be made. Then, theories relevant to the mechanisms of self-talk and conceptual models that have been proposed will be introduced, and finally research findings in the sport literature will be described and a working model for self-talk mechanisms will be introduced.

The second study (Galanis, Hatzigeorgiadis, Zourbanos, Papaioannou, & Theodorakis, 2017) is a quantitative study including six experiments that focused on direct tests of different dimensions and domains of attention (attentional performance) as such described by Sturm (2005) using a between-subjects experimental design. Specifically, the purpose was to investigate the effects of self-talk on alertness and vigilance/sustained attention (intensity of attention), selective, focused, and divided attention (selectivity of attention), and finally spatial attention. It was hypothesized that the use of self-talk cues following a self-talk intervention would improve attentional performance for all the attention functions.

The third study (Galanis, Hatzigeorgiadis, Zourbanos, Charachousi, Sanchez, & Theodorakis, 2017) is a quantitative study including one lab and one field experiment that focused on the effectiveness of self-talk strategies on task performance under conditions of external distraction. In particular, have been examined experimentally the effects of self-talk strategies on performance under

conditions of auditory distractions in two different settings (lab and field). The lab experiment involved performance on a computer game requiring fine motor execution. The field experiment involved free-throwing in basketball. It was expected that in both settings under condition of distraction performance of the self-talk groups would be superior to that of the control groups.

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CHAPTER 2: SELF-TALK MECHANISMS

Why self-talk is effective? A review on the self-talk mechanisms in sport

[1]

Abstract

Self-talk interventions have proven effective for enhancing performance. Identifying the mechanisms underlying the effectiveness of self-talk strategies is now among the top priorities for a comprehensive understanding of the self-talk phenomenon. The present chapter aims at providing an overview of the existing literature and guidance for further research developments on the self-talk mechanisms. First evidence from self-talk interventions that stress the importance of studying the self-talk mechanisms will be summarized. Subsequently, preliminary evidence and existing conceptual models on the self-talk mechanisms will be presented. Finally, theoretical frameworks that can be adopted to accommodate findings pertaining to the self-talk mechanisms, supported by empirical evidence regarding the mechanisms explaining the self-talk performance relationship will be presented to support a dynamic model of self-talk mechanisms in sport.

Key words: attention, motivation, cognition, affect, performance, behaviour

[1] *Galanis, E., Hatzigeorgiadis, A., Zourbanos, N., & Theodorakis, Y. (2016). Why self-talk is effective? A review on the self-talk mechanisms in sport. In M. Raab, P. Wylleman, R. Seiler, A.M. Elbe, & A. Hatzigeorgiadis (Eds.), Sport and Exercise Psychology Research: From Theory to Practice (1st Ed., 181-200). Elsevier.*

The reciprocal relationships and the interactions between cognition, affect and behavior lie in the core of the psychological inquiry. Despite the global acceptance of such a position, one aspect of human cognition and functioning that has been relatively neglected until recent years in the sport psychology literature is the role of what people say to themselves. Eventually, through the expansion of the field, the links between self-addressed statements and action captured researchers' attentions and nowadays the study of self-talk has been receiving increased research attention. In a simple way Hatzigeorgiadis, Zourbanos, Latinjak and Theodorakis (2014, p. 372) described self-talk as "what people say to themselves either silently or aloud, inherently or strategically, to stimulate, direct, react and evaluate events and actions". People talk to themselves a lot. What people say to themselves can refer to the past (evaluate and react to things that have happened) or the present/future (to stimulate and direct action). Most of the times this self-process happens inside their heads (silently), and this comes naturally (inherently/automatically); however sometimes it occurs audibly (aloud) and many times, and particularly in achievement contexts such as sport, people talk to themselves for a purpose (strategically) and based on a plan to achieve certain outcomes.

The strategic use of self-talk in sport involves the use of cue words aiming at enhancing performance through the activation of appropriate responses. The principle underlying the use of self-talk strategies is that athletes provide to themselves appropriate instructions for action, and subsequently execute the appropriate action by simply following the self-instruction they have used, or reinforce themselves towards a desired outcome (Hatzigeorgiadis et al., 2014). There are robust findings supported through meta-analytic evidence that self-talk strategies in sport are effective in enhancing performance and facilitating learning (Hatzigeorgiadis, Zourbanos,

Galanis, & Theodorakis, 2011); however the variety of effects in different settings and populations has forwarded the need to understand how self-talk works, i.e., the mechanisms underlying its effectiveness. Understanding the mechanisms of self-talk is significant because it will help improving interventions and, importantly, adapting interventions to match situational demands and individual needs.

At the apex level the social cognitive perspectives of human functioning provide the platform for the exploration of the links between thought and action. Bandura's social cognitive theory for the study of human behaviour (Bandura, 1986) describes a model of reciprocal causation between behaviour, personal, and environmental factors, reflecting the interaction between cognitive, affective and physiological states. The reciprocal determinism approach has been very influential within the field of motivation postulating that the interaction of individuals' thought and affect energise, direct, and regulate behaviour in achievement contexts.

More specific to the role of self-instruction is Zimmerman's (2000) approach to self-regulation. Zimmerman in the theory of self-regulation identified three cyclical phases, forethought, performance, and self-reflection. Within the performance phase, strategies such as self-instructional statements serve as discriminative stimuli to focus on key elements of the task (Schunk & Zimmerman, 2003), thus influencing performance and subsequently self-reaction including emotions in the self-reflection phase.

From an applied perspective, the development of self-instructional training that eventually led to the growth of self-talk strategies has been significantly influenced by psychotherapeutic approaches. Meichenbaum (1977) in his cognitive behaviour modification model identified the important role of self-instructional training for treating cognitive and emotional disorders. Meichenbaum regarded self-

statements as indices of individuals' beliefs and suggested that statements addressed to oneself can influence individuals' attentional and appraisal processes, thus regulating behavioural performance. Similarly, Ellis (1976) based on the assumption that intrusive thoughts lay at the core of anxiety and emotion, argued that thoughts are central to the formation and change of emotions. Restructuring the content or reducing the frequency of such thoughts during performance situations, provided the foundation for cognitive and cognitive-behavioural approaches to reducing performance anxiety and subsequently improving performance. Overall, within a cognitive behaviour therapy perspective, self-instructional training has been claimed to be useful in facilitating the learning of new skills and in enhancing the performance of adaptive responses (Rokke & Rehm, 2001). The theories presented above provide a foundation for the effectiveness of self-talk, but also for the potential mechanisms underlying the behavioural outcomes of self-talk, through the identification of attentional and motivational mechanisms, including cognitive and affective responses. Based on the above foundations and the effectiveness of self-talk strategies in educational and clinical psychology settings, the investigation of self-talk in sport eventually attracted significant research attention.

This chapter aims at providing an overview of the literature relevant to the identification of the self-talk mechanisms and offering a framework for the development of future research for the better understanding of the self-talk mechanisms. First, evidence supporting the effectiveness of self-talk in sport will be briefly presented to document the need for research on self-talk mechanisms. Subsequently, preliminary evidence regarding the potential factors explaining the effectiveness of self-talk strategies will be described and conceptual models that have been developed for the understanding of the mechanisms will be presented. Finally,

theoretical perspectives that may accommodate research developments will be delineated and empirical evidence from the limited research on the self-talk mechanisms in sport will be reviewed, to support a proposed model mapping the constructs and the evidence surrounding the self-talk mechanisms research in sport.

The effectiveness of self-talk strategies

An overview of the self-talk literature in sport reveals that research has emphatically focused on the effectiveness of self-talk strategies for performance enhancement. This line of investigation involves conducting experiments and applying interventions using self-talk strategies and assessing the impact of using self-talk cues on performance. The reason for the popularity of this research is its direct applied value, as self-talk strategies appear to be effective in facilitating learning and enhancing performance, and such strategies can be immediately used in teaching, training, and competition settings.

In a review of the relevant literature, Theodorakis, Hatzigeorgiadis, and Zourbanos (2012) identified four levels at which the effectiveness of self-talk interventions have been investigated in sport: (a) effects on fundamental motor tasks (e.g., vertical jump; Edwards, Tod, & McGuigan, 2008); (b) effects on components of performance in different sports (e.g., basketball free throw shooting; Perkos, Theodorakis, & Chroni, 2002); (c) effects on sport performance in non-competitive settings (e.g., running; Weinberg, Miller, & Horn, 2012); and (d) effects on sport performance in competitive settings (e.g., swimming; Hatzigeorgiadis, Galanis, Zourbanos, & Theodorakis, 2014). The effectiveness of self-talk has been emphatically supported through a meta-analysis examining the effect of self-talk interventions on performance (Hatzigeorgiadis et al., 2011). The results revealed a

moderate positive effect size (d = .48), thus providing robust evidences for the value of self-talk interventions. Examination of possible factors that may moderate the effectiveness of self-talk showed that self-talk was more effective in fine and novel tasks rather than gross and learned tasks, and in intervention including some type of self-talk training rather than interventions where participants were asked to make use of self-talk cues without prior practice. Overall, there is now strong support for the benefits of using self-talk to facilitate learning and enhance performance in motor and sport settings.

A close look at the results from the different interventions suggests that different self-talk cues have different effects on task performance. Theodorakis, Weinberg, Natsis, Douma, and Kazakas (2000) proposed a self-talk type by task characteristics matching hypothesis. They speculated that instructional self-talk cues should be more suitable for fine tasks, whereas motivation self-talk cues should be more suitable for gross tasks. A series of experiments in task with different characteristics provided partial support for this matching hypothesis (Hatzigeorgiadis, Theodorakis & Zourbanos, 2004; Theodorakis et al., 2000). Importantly the matching hypothesis was partially supported through the results of the meta-analysis showing instructional self-talk was more effective than motivational self-talk for fine tasks and that instructional self-talk was more effective for fine tasks rather than gross tasks (Hatzigeorgiadis et al., 2011).

Two more matching hypotheses have been proposed by Hatzigeorgiadis et al. (2014). The first suggests a self-talk type by learning stage matching, and the second, a self-talk type by performance setting matching. According to the former, it was claimed that for novel tasks, or for individuals in the early stages of learning, instructional self-talk will be more beneficial, whereas for well learned tasks, or for

individuals in the automated phase of performance, motivational self-talk will be more beneficial. A relevant study by Zourbanos, Hatzigeorgiadis, Bardas, and Theodorakis (2013) provided preliminary support for this hypothesis. In particular, it was found that in a handball shooting task instructional self-talk had a larger effect than motivational self-talk when performing with the non-dominant arm, whereas a marginal effect in favor of the motivational self-talk emerged for the dominant arm. According to the latter matching hypothesis, it was claimed that instructional self-talk should be beneficial in learning and training settings, whereas motivational self-talk will be more beneficial in performance and competition settings. Indirect evidence regarding this proposition have been provided by Hatzigeorgiadis et al. (2014) in an intervention aiming at testing the effectiveness of self-talk strategies in a competitive performance setting. Through an 8-week training programme in the use of instructional and motivational self-talk, young swimmers developed their personal self-talk plans for the competition. Apart from the effectiveness of the intervention as this evidenced in the competition results, an examination of the content of the cues swimmers adopted, revealed that the competition self-talk plans were, with minor exceptions, dominated by motivational self-talk cues.

Hatzigeorgiadis et al. (2014) argued that to develop effective interventions researchers and practitioners should take into consideration the type of the task, the situational demands, and personal preferences. Taken together the findings reported above suggest that different self-talk cues may be more or less effective in a given context, or that the same self-talk cues may be more or less effective in different contexts. This postulation suggests that self-talk may serve different purposes through the stimulation of different functions. As a result there is an increasing interest in

exploring the mechanism that explain the facilitating effects of self-talk on task performance.

Preliminary research and conceptual models

Preliminary evidence for the exploration of possible self-talk mechanisms has emerged through testimonials from athletes. In an early study with young tennis players, Van Raalte, Brewer, Rivera, and Petitpas (1994) explored the relationship between self-talk and performance based on observable self-talk and gestures. In follow-up discussions athletes reported that positive self-talk helped them enhancing their motivation and keeping their calmness. In three studies using single-subject multiple-baseline design to test the effectiveness of self-talk in triathletes, tennis and football players, participants reported that self-talk helped them feeling more confident, improving their concentration and directing their attention efficiently (Johnson, Hrycaiko, Johnson, & Halas, 2004; Landin & Hebert, 1999; Thelwell & Greenlees, 2003). Similar reports have been made by basketball players following a 12-week self-talk intervention (Perkos et al., 2002).

More systematic reports through interviews have been provided in three studies. Wayde and Hanton (2008) focused on the mechanisms through which self-talk operates. Athletes from a variety of sports stated that self-talk helped them to control their anxiety responses, increase their levels of effort and motivation, increase their concentration, and enhance their levels of self-confidence. Recently, Miles and Neil (2013) in an attempt to further elaborate on the mechanisms of self-talk interviewed elite cricket players based on video footage. The results showed that the use of instructional and motivational self-talk enhanced athletes' skill execution, self-efficacy, and focus of attention, and reduced performance anxiety. Finally, Cutton and

Hearon (2014) in a case study mentioned that the self-talk of a world champion power lifter was associated with staying focused, regulating effort, maintaining motivation, and improving skills. Overall, these findings based on athletes' perceptions have offered initial viewpoints regarding the effects self-talk may have on several performance aspects, and have provided the basis for the further development of research onto the self-talk mechanisms.

Based on the above prepositions, previous empirical evidence, and raw data collected from athletes' reports, Theodorakis, Hatzigeorgiadis, and Chroni (2008) forwarded a perceptual operationalisation regarding the functions of self-talk. A series of qualitative and quantitative analyses led to the development of a multidimensional model and instrument depicting the self-talk functions (Function of Self-Talk Questionnaire; FSTQ). According to this model self-talk can serve to (a) improve attentional focus, (b) increase self-confidence, (c) regulate effort, (d) control cognitions and emotions, and (e) trigger automatic execution. Following the development of the FSTQ, studies explored differences in the functions of self-talk in relation to different self-talk cues settings. In a study with physical education students, Hatzigeorgiadis (2006) compared the effects of instructional and motivational self-talk on a swimming task and the FSTQ dimensions. The results revealed that participants scored higher on the effort dimension of the FSTQ when using motivational self-talk, compared to when using instructional self-talk. In a similar investigation, Hatzigeorgiadis, Zourbanos, and Theodorakis (2007) examined the effects of a technical instruction and an anxiety regulation cue in a water polo precision task under evaluative conditions. The results revealed that participants scored higher on the cognitive and emotional control dimension of the FSTQ when using the anxiety regulation self-talk cue, than when using the technical instruction

cue. These findings support the notion that in different situations self-talk may serve, at different intensity, different functions that may operate in tandem (Hardy, Oliver, & Tod, 2009).

For the better understanding of the possible mechanisms through which self-talk facilitates sport performance, Hardy and colleagues proposed a conceptual model with four dimensions of mechanisms that may explain the effects of self-talk on performance (Hardy et al., 2009). First, a cognitive dimension of mechanisms referring to aspects such as information processing, concentration, attentional control, and attentional style; second, a motivational dimension of mechanisms, referring to self-efficacy and persistence; third, a behavioural dimension of mechanisms referring to technique improvement; and last, an affective dimension of mechanisms referring to regulation of affective states. This conceptualization shares certain characteristics with the mechanisms suggested through the functions of self-talk model presented above, but also introduces new elements and a more elaborate categorization of self-talk mechanisms. The above models in combination with theoretical frameworks and perspectives underlying the potential impact of self-talk have been useful in fostering contemporary research for the study of self-talk mechanisms. The sections that follow review the up-to-date relevant research and provide a contemporary perspective towards the development of a comprehensive model of self-talk mechanisms.

A prospective model of self-talk mechanisms

The scant research on the mechanisms underlying the effectiveness of self-talk so far has focused on two wider clusters of mechanisms: attentional and motivational. In this quest, several existing theoretical models have been used to develop research

questions or interpret research findings. In addition, further theoretical frameworks can be adopted to accommodate findings pertaining to the self-talk mechanisms, but also provide the appropriate foundation for developing future research and inform applications. In the section that follows such frameworks will be presented with emphasis on those that can be linked to empirical evidence regarding the mechanisms explaining the self-talk performance relationship.

To facilitate the understanding of this section, a prospective model mapping the constructs and the theories that can be used to accommodate existing, but also future, research hypotheses and findings is presented in Figure 2.1. Based on the premises of the theoretical foundations described at the beginning of this chapter, and taking into consideration Hardy et al's (2009) model, our current conceptualization includes two broad clusters of mechanisms mediating the effect of self-talk on performance, which reflect the relevant theories but mostly the existing self-talk literature in sport. The first cluster relates to an attentional interpretation of the facilitating effects of self-talk, comprising the different dimensions of attention (intensity-vigilance, selectivity-executive, and spatial-orienting), and including attentional constructs and theoretical perspectives that can be linked to the study of self-talk mechanisms; width and direction of attention, distractibility, and mental effort. The second cluster relates to a motivational interpretation of the facilitating effects of self-talk, comprising cognitive, affective and behavioural aspects of motivation, and including constructs and theoretical perspectives that can be linked to the study of self-talk mechanisms; self-efficacy, self-confidence and anxiety, and effort and persistence.

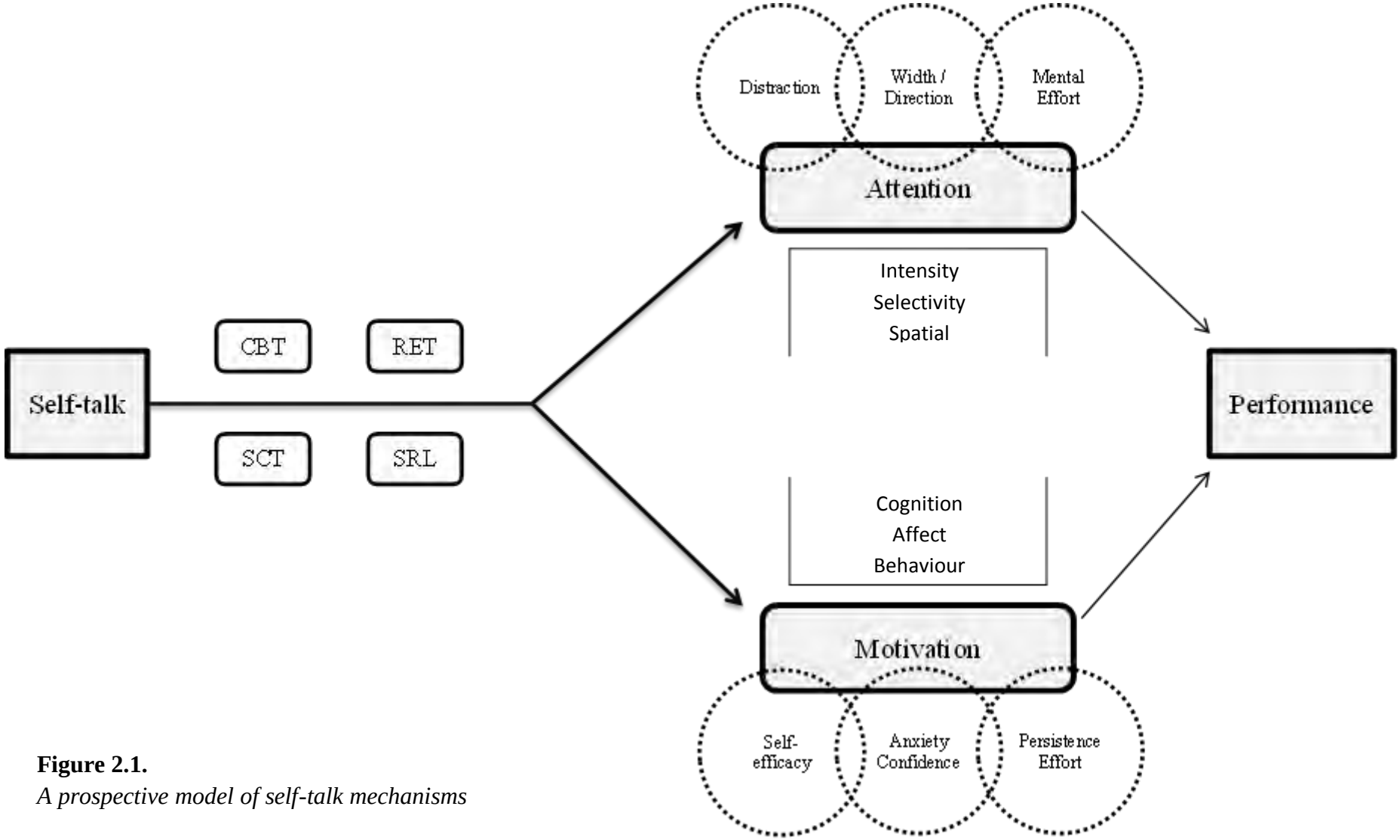

Figure 2.1.
A prospective model of self-talk mechanisms

Attentional perspectives

Dimensions and domains of attention

Attention has been identified and widely acknowledged as a multi-dimensional cognitive ability. Posner and Petersen (1990) proposed a taxonomy of attention dimensions. They suggested that attention can be divided into three subsystems: orienting (orienting to sensory events), detecting (detecting signals for focal conscious processing), and alerting (maintaining an alert state). Based on Posner's model, Van Zomeren and Brouwer (1994) distinguished attention in two main domains: selectivity (attention can be directed to a certain location) and intensity (attention can be maintained to a certain location). In addition, the authors subdivided the selectivity aspect into focused and divided attention. Attempting a synthesis of Posner's and Van Zomeren and Brouwer's models, Sturm (2005) created a more inclusive framework for studying the dimensions of attention. The model describes three different dimensions of attention and their corresponding neuropsychological attention domains: (a) intensity, which includes alertness, sustained attention, and vigilance, (b) selectivity, which include selective, focused and divided attention, and (c) spatial attention.

Based on Sturm's taxonomy of the attentional dimensions, we have conducted a series of experiments to examine the effects of self-talk on attentional domains (Galanis, Hatzigeorgiadis, Zourbanos, Papaioannou, & Theodorakis, 2016), using the Test Battery for Perception and Attention Functions (WAF tests) of the Vienna Test System (VTS, Sturm, 2006). The WAF tests battery consist of six tests which reflect alertness and vigilance/sustained attention (intensity), selective, focused, and divided attention (selectivity), and finally spatial attention. A series of experiments were conducted to measure the six attentional domains involving in total 255 participants.

A five days experimental procedure was followed for each experiment, comprising three phases, baseline trial, attention training, and final assessment.

The first set of experiments examined the effects of self-talk strategy on attention intensity. In the first experiment, alertness, the ability of the individual to control arousal and response readiness (intrinsic and phasic), was tested in a combination of visual and audio tests. The results showed that the experimental group produced better reaction times compared to the control group in five out of the six tests. In the second experiment, vigilance, the ability of individuals to direct attention to one (or more) stimulus for a long time (with a low stimulus rate) was tested (visual test). In accordance to the first experiment, the results revealed that the experimental group had significantly faster reaction time than the control group.

The second set of experiments examined the effects of self-talk on attention selectivity. In the first experiment, selective attention, the ability of the individual to focus on a specific stimulus while irrelevant stimuli have to be ignored was tested in two tests (visual and audio). In the second experiment, focused attention, the ability to focus on a specific stimulus, was tested in three tests (visual, audio, and cross-audiovisual). Finally, in the third experiment, divided attention, the ability of individuals to respond simultaneously to two (or more) different tasks was tested in two tests (visual and cross-audiovisual tests). The results showed that for all seven tests of selective attention the experimental group performed better than the control group.

The third experiment examined the effects of self-talk on spatial attention, the ability of the individual to focus his/her attention on a location in the space in three tests (central cues, peripheral cues, and neglect). The results showed that in all three tests participants of the experimental group displayed faster reaction times than

participants of the control group. Overall, the above findings involving direct tests of attentional performance provide strong evidence that the effects of self-talk on individuals' attentional functioning is a viable mechanism explaining the facilitating effects of self-talk strategies on task performance.

Width and Direction of Attention

Nideffer's theory of attentional style (Nideffer, 1976) provides an interesting framework for the study of attention in sport in general and in relation to self-talk in particular. Nideffer identifies two dimensions of attention, direction and width. Direction denotes the target of the focus and may be internal or external. An internal focus involves directing attention inwards, e.g., thoughts and feelings, whereas an external focus involves directing attention outwards, e.g. the environment. Width denotes the range of attention and varies on a continuum from narrow (one or few sources of relevant stimuli) to broad (many sources of relevant stimuli). The two dimensions create fourfold model of attentional focus, internal-narrow, internal-broad, external-narrow, and external-broad. In some sports a particular type of attention is required to achieve quality performance, whereas in other the focus of attention should shift from type to type to meet the demands of the situation/game progress. Even though the model has attracted relatively limited research attention, the shifting of attention aspect of the theory can be linked to the use of self-talk. In particular, self-talk strategies can be effective in facilitating athletes shifting the focus of attention to the attentional style appropriate to perform a skill, thus improving performance.

Indirect support for this hypothesis have been provided by Ziegler (1987) who examined the effects of a four-step verbal cueing program, each reflecting the

attentional focus appropriate for different phases of a motion, on tennis forehand and backhand groundstrokes. The interventions aimed at shifting attention between narrow external and broad external. The results showed that the intervention was indeed effective in enhancing performance; however, no direct assessment of attentional focus was applied. Further indirect evidence regarding the effective directing of attention have been also reported from Landin and Hebert (1999) and Mallett and Hanrahan (1997) who developed interventions for tennis and sprinting respectively. In these studies however, the focus of attention did not shift in terms of width or direction, but in terms of target within a narrow internal focus. For example, Malett and Hanrahan (1997) split a 100m race into segments and developed a race plan using self-talk cues to direct attention to appropriate stimuli depending on the segment of the race. The above evidence provides support to another potential attentional mechanism related to the regulation, directing and shifting, of attentional focus within sport. Similar indirect evidence from experiments using combination of self-talk cues to direct attention to different external targets has been reported by (Hatzigeorgiadis et al., 2004, Theodorakis et al., 2000; Zourbanos et al., 2013).

Internal and external focus of attention

A somewhat different conceptualization of the focus of attention direction that has attracted significant research attention in the motor learning domain is the internal-external focus of attention approach to learning and performance (Bernstein, 1996; Wulf & Prinz, 2001). Internal focus refers to focusing one's attention to the action itself, i.e., the body and the movement of the limbs, whereas external focus refers to focusing one's attention to the effect of the action, i.e., the outcome of the movement. The effectiveness of internal versus external focus has been central in this

literature and an issue of great debate (see Toner & Moran, 2015, 2016; Wulf, 2016). In favor of the external focus effectiveness, Wulf and Prinz (2001) have forwarded the constrained-action hypothesis, claiming that an internal focus of attention may restrict the automatic processes that would normally control a movement, whereas an external focus would promote an inherent self-organization processes that will eventually facilitate learning and performance. In contrast, in favor of an interaction approach taking into consideration the skill level of athletes Bernstein (1996) argued that due to differences in automizations an external focus will be more beneficial for skilled athletes. These propositions have received empirical support showing that different stages of skill acquisition require different cognitive processes, with a trend for increased proceduralization, linked to an external focus of attention, as expertise increases; whereas at earlier stages of learning an internal focus may even help skill acquisition (Beilock & Carr, 2001; Beilock, Carr, MacMahon, & Starkes, 2002). In addition, Shusterman (2008) in his 'somaesthetic awareness' approach argues that conscious processing strategies may be useful when adjusting or attempting to regain prior high levels of performance, as deliberate attention to aspects of movements may restore their efficiency.

Regardless of the focus of attention that is mostly relevant and effective for task performance, the use of self-talk strategies may strengthen the quality of the focus, either internal or external. In such a study, Bell and Hardy (2009) examined the effects of attentional focus on skilled performance in golf. They used three different attention foci reflecting on internal, proximal external and distal external focus self-talk cues under two experimental conditions: neutral and anxiety condition. The results indicated a better performance in distal external focus self-talk rather that internal and proximal external focus self-talk in both neutral and anxiety conditions.

In addition, proximal external focus compared to internal focus displayed better performance in both neutral and anxiety conditions. Importantly, a manipulation check revealed that participants in the three conditions reported greater focus on the respective type of attentional focus induced by the manipulation, thus supporting that self-talk influenced the strength of the focus.

To further explore the effectiveness of self-talk on improving internal and external focus of attention two, still ongoing, experiments on an endurance cycling task are been conducted in our lab. Each experiment comprises three groups: (a) a group receiving no attention instruction, (b) a group receiving an internal/external attention instructions, and (c) a self-talk group receiving the same internal/external instruction and in addition are assigned an internal/external self-talk cue to further support the respective instruction. Preliminary analyses for the internal focus experiment that has been completed suggest that the internal focus self-talk group reported greater internal focus and performed better than the internal focus instruction only group, which reported greater internal focus and performed better than the control group (Charachousi, Christodoulou, Gourgoulias, Galanis, & Hatzigeorgiadis, 2015).

Internal and external distraction

An important for the field of sport approach to the study of attention, which may be linked to the study of self-talk mechanisms, is the distraction approach (Moran, 1996). Nelson, Duncan, and Kiecker (1993) described a distraction as the occurrence of competing stimuli that may interfere with task related stimuli and divert attention from its original focus. Moran (1996) argues that the study of distraction is not straightforward because it involves stimuli evolving from the environment and the

self, but also their interaction. Moran subsequently referred to stimuli from the environment (such as noise, irrelevant visual stimuli, and environmental conditions) as external distractions, and to stimuli evolving from within (such as thoughts, mostly negative but also positive) as internal distractions. The study of external distractions has received more research attention, possibly due to methodological convenience of creating and manipulating such distractions (Eysenck & Keane, 1995). This research has adopted a cognitive psychology perspective through the examination of the impact of distractions to behavioural outcomes and performance. In contrast, the role of internal distractions, which encompass aspects of the self-talk phenomenon, has been less studied. Distractions have been linked with impaired performance and from information processing perspective this can be attributed to the detrimental effects of distraction to processing efficiency, as they occupy part of the working memory which could be used for task processing purposes (Eysenck, 1992). A plausible hypothesis regarding the role of self-talk would be that self-talk strategies can help minimize the occurrence and the influence of distractions, both external and internal.

Regarding internal distractions, Hatzigeorgiadis et al. (2004) examined the effects of motivational and instructional self-talk on performance but also on the occurrence of interfering thoughts during task performance in two water-polo tasks (precision and power). The results showed that both self-talk types reduced the occurrence of interfering thoughts in both tasks. In addition, reductions in interfering thoughts were related to improvements in performance in one of the two tasks. This suggests that self-talk reduces internal distractions, however whether this relates to performance may depend on other factors such as the demands of the task. Similar findings were reported in another experiment involving a swimming task (Hatzigeorgiadis et al., 2007).

Regarding external distractions, recently completed research (Charachousi, Tsetsila, Tsimeas, Galanis, & Hatzigeorgiadis, 2014; Galanis, Hatzigeorgiadis, Sarampalis, & Sanchez 2016) has provided useful preliminary data. In particular we have conducted two experiments, one in the lab and one in the field examining the effectiveness of self-talk on task performance under conditions of extreme, non-continuous, sudden, high tone noise. In the lab experiment students were asked to complete a computer game, whereas in the field experiment female basketball players were tested on free-throw shooting. In both experiments participants of the experimental group, who received self-talk training, performed better than participants of the control group. The findings overall seem to support a protective effect of self-talk against distractions, both internal and external, thus suggesting that this is another viable attentional mechanisms of self-talk.

Mental effort

An attentional approach that stems from the capacity models of attention is the mental effort approach (Kahneman, 1973). Kahneman described attention as a reservoir of mental energy from which resources are drawn to meet situational attentional demands for task processing. He then argued that mental effort reflects variations in processing demands. Among the assumptions underlying this approach of particular interest is that (a) mental effort increases with task difficulty/complexity, and (b) learning results in reduction of mental effort required performing a task and producing a certain outcome. Kahnneman proposed that pupil dilation is the best physiological index to detect changes in mental effort, as it has proven effective in identifying between-tasks and within-tasks variation in pupil dilation reflecting the assumptions mentioned above. Beatty and Lucero-Wagoner (2000) introduced the

term Task Evoked Pupillary Responses to describe dilations in the pupil due to cognitive processing of stimuli on a task, and stressed the importance of pupilometry as a measure reflecting brain activity and concomitant with cognitive processes.

In recently conducted experiments (Galanis et al., 2016) we have tried to explore the impact of self-talk on mental effort through pupilometry (eye tracker). We conducted two experiments involving a computerized fine motor task under conditions of different attentional demands manipulated through the generation of noise using a mixed, within and between, subject design. The analyses provided support for the integrity of our experiments. In accordance with the theory's assumptions, the pupil diameter decreased in the experimental trial compared to the baseline trial in both experiments (learning effect). In addition, the pupil size was greater in the second experiment when an audio distraction was introduced to increase the attentional demands. Moreover, it was revealed that the performance of the self-talk group was superior to that of the control group, whereas pupil dilation was smaller. These results seem to support an important performance effect through reduced mental effort that could be interpreted as a more effortless attention effect of self-talk. These findings albeit preliminary provide an exciting prospect and encourage further investigation of pupil dilation, as an index of mental effort, in relation to self-talk strategies and their underlying mechanisms.

Motivational Perspectives

Cognition: Self-efficacy

Bandura's self-efficacy theory (Bandura, 1997) has been central in the field of human motivation and offers a sound framework that can partly accommodate the effects of self-talk on performance. Among the sources of self-efficacy Bandura, in

his original formulation of the theory, identified the small but potentially important role of verbal persuasion from others. Further considering the role of the verbal persuasion source, Hardy, Jones, and Gould (1996) argued for the importance of one's own self-persuasion through self-talk. Athletes can enhance their self-efficacy through statements addressed to themselves regarding their capabilities to attain certain outcomes. As self-talk has been linked to performance, self-efficacy may have an important mediating role in this relationship.

In a primary attempt to test this hypothesis, Hardy, Hall, Gibbs, and Greenslade (2005) examined the effects of instructional and motivational self-talk has on self-efficacy using a sit-up task. In general, the results revealed that both instructional and motivational self-talk were positively related to self-efficacy. Additionally, self-efficacy was positively related to sit-up performance, but neither self-talk dimension was related to performance. Hatzigeorgiadis, Zourbanos, Goltsios, and Theodorakis (2008) examined the effects of a self-talk intervention on self-efficacy and performance among young tennis players. The results revealed that the use of motivational self-talk significantly increased both self-efficacy and performance, compared to a control group. In addition, it was revealed that increases in self-efficacy were related to increases in performance, thus providing supporting evidence for the mediating role of self-efficacy. Similar findings have been reported by Zetou, Vernadaki, Bebetsos, and Makraki (2012) who examined the effects of instructional self-talk on the learning of a volley service skill and self-efficacy among young female volley players. The results indicated that the self-talk group displayed better performance and reported increased self-efficacy compared to a control group. Chang et al. (2014) examined the effects of self-talk on softball throwing performance and self-efficacy. The results revealed that both instructional and motivational self-

talk improved performance; in addition they reported increase in self-efficacy for the motivational self-talk group. Overall, the self-efficacy hypothesis has received more research attention compared to other potential mechanisms, and considerable support as a plausible self-talk mechanism.

Affect: Anxiety and self-confidence

As identified in the previous section of the chapter, self-talk has been central to cognitive and cognitive-behavioural interventions for cognitive and emotional disorders, and behaviour in general (Cognitive Behaviour Therapy, Meichenbaum, 1977; Rational Emotive Behaviour Therapy, Ellis, 1976). More emphatically Bernard, Ellis, and Terjensen (2006) identified the empowering aspect of self-talk on emotions in general and anxiety reduction in particular. Meichenbaum (1977) argued that self-statements will bring more adaptive thoughts and lead to more effective coping behaviour under anxiety inducing situations. In sport, performance anxiety and its treatment, through regulation of intensity or restructuring, is an issue of particular interest at both the applied and the research spectrums. Although self-talk has been identified as a potential strategy for reducing anxiety research has been scarce.

In an intervention study with young tennis players, Hatzigeorgiadis, Zourbanos, Mpoumpaki, and Theodorakis (2009) found that the use of motivational self-talk following a three-day self-talk training intervention resulted in improved performance and self-confidence, when performing under anxiety inducing conditions. Importantly, a significant effect was identified for cognitive anxiety and a marginal effect for somatic anxiety, with participants of the interventions group reporting lower levels of anxiety than those of a control group. Further empirical evidence regarding effects of self-talk on anxiety, but also on emotion regulation in

general, will strengthen our confidence for the popular, through anecdotal reports, belief regarding the role of self-talk for anxiety regulation, thus providing a basis for the mediating role of emotion regulation in the self-talk performance relationship.

Behaviour: Effort and persistence

Recent theorizing on perceptual interpretations of exertion and the regulation of effort, as these expressed through the psychobiological model of endurance performance (Marcora, Bosio, & Morree, 2008; Marcora, Staiano, & Manning, 2009), forwards another possible explanation for the facilitating effects of self-talk on performance, at least endurance performance, within a motivational perspective. According to the psychobiological model, exhaustion which limits the ability to sustain aerobic exercise is created by the conscious decision to terminate endurance task performance. The model suggests that perception of effort is a critical factor for endurance performance; hence, endurance performance might be affected by any physiological or psychological factor influencing perception of effort-exhaustion (Marcora et al., 2008; Marcora et al., 2009).

Blanchfield, Hardy, de Morree, Staiano, and Marcora (2014) examined the effect of a motivational self-talk intervention on cycling endurance performance, and ratings of perceived exertion. They found that the self-talk group had greater cycling time to exhaustion while reporting lower RPE during the task. In addition, no differences were recorded in facial EMG, which was assessed as a psychophysiological measure of perceived effort assessed during and near completion of the test, heart rate during and at completion of the test, and lactate concentration 3 minutes post-completion. In a similar study, Barwood, Corbett, Wagstaff, McVeigh, and Thelwell (2015) reported that motivational self-talk during a 10km cycling task

resulted in increased power output, which were matched by increases in oxygen consumption, while no differences were observed in ratings of perceived exertion were stated.

Hatzigeorgiadis, Bartura, Argyropoulos, Zourbanos, and Flouris (2016) examined the effects of a motivational self-talk intervention self-talk on endurance cycling performance in extreme heat conditions. Participants were asked to cycle at a fixed perceived exertion rate (between 14 and 15 on the 6-20 Borg scale) for 30 minutes. The results revealed that self-talk group exhibited greater power output than the control group and the same pattern was revealed for oxygen consumption, while no differences were recorded for perceptual variables (perceived exertion, thermal comfort, and thermal sensation) and physiological variables (respiratory quotient, core, skin, and muscle temperature). In summary, the above evidence provide support for a perceptual interpretation of the beneficial self-talk effects, as these recorded through enhanced input (effort, persistence) and subsequently output (covered distance, elapsed time), thus supporting the psychophysiological model of endurance performance and the fit of self-talk strategies within this model.

Conclusions and directions for future research

The study of self-talk mechanisms in sport is an emerging field of inquiry. The model described in this chapter is conceptually narrow as it was aimed at portraying the current literature; thus we consider this as a provisional, but dynamic, model under construction. In comparison to the conceptual model proposed by Hardy et al. (2009), our model focuses on the sport literature that has directly examined potential mechanisms and this is why the clustering of some mechanisms appears different. The two models identify similar mechanisms; however our model, based on the current

state of research, in essence covers in a more thorough way, parts of the broader conceptual model introduced by Hardy et al. (2009). In particular, our model (a) focuses on the attentional aspect of cognitive mechanisms, and (b) examines cognitive, affective, and behavioral aspects of motivation. Hardy et al. (2009) identify the attentional processes as part of a wider cognitive mechanism, which however has attentional processes at its core. In addition, in Hardy et al's model affective aspects are identified as separate cluster of mechanisms. Research looking further into the emotion regulation aspect of self-talk will help providing support for the integrity of the affective mechanisms underlying the effectiveness of self-talk. We believe that the relevant research is still in a premature stage to support with confidence a robust model of self-talk mechanisms. Thus, the model is subject to updates and modifications. Eventually, as research will grow we expect that the two models will be integrated to accommodate the different perspectives and contribute to the development of a comprehensive model of self-talk mechanisms.

The approaches and the evidence reviewed in this chapter provide challenging research perspectives for the understanding of self-talk mechanisms and the self-talk phenomenon in total. Basic research seems to be a priority towards this direction. The advances in the self-talk literature can help designing and testing new hypotheses; basic research will help exploring these hypotheses and provide direction for field approaches. Within this frame, a multidisciplinary approach involving physiological and neurophysiological variables will greatly enhance our understanding and expand the field. Heart rate variability measures can help identifying self-talk related responses of the autonomic nervous system modulation, possibly linked to motivational and affective states. Investigation of gaze behaviour and eye fixations through eye-tracker technology can help exploring hypotheses regarding the different

dimensions and subdomains of attention, and the cognitive processes under different self-talk conditions, within the attentional theoretical frameworks linked to self-talk. Furthermore, portrayals of brain activity through Electroencephalography (EEG) and Functional Magnetic Resonance Imaging (fMRI) can prove valuable tools for understanding how the brain regions activate when individuals talk to themselves, and whether different types of self-talk are related with different activation in the brain regions. Developments through basic research can then guide the applied field. Applied research has dominated the self-talk literature in sport and has provided useful directions for practice. However, it will be important to increase the focus on athletes and sport settings, through interventions testing hypotheses regarding the self-talk mechanisms and supporting the external validity of findings on the self-talk mechanisms. Finally, as research thus far has mostly focused on the examination of potential mechanisms as outcome measures, it will be important to eventually investigate full mediated relationships between self-talk, potential mechanisms, and performance.

The study of the mechanisms underlying the effectiveness of self-talk for enhancing sport performance is an exciting research endeavor. Understanding the mechanisms will help developing effective interventions, considering personal, situational, and contextual factors. Most importantly, it is through the identification of mechanisms governing the effectiveness of self-talk that a comprehensive self-talk theory can be formed to guide research and inform practice. The model proposed in this chapter is intended as a dynamic platform for the development of systematic research on self-talk mechanisms. We expect that such research will inform further developments of this model, and facilitate the creation of a unified self-talk theory.

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CHAPTER 3: SELF-TALK AND ATTENTION

Self-talk cues can improve attentional performance

[2]

Abstract

In the performance psychology literature the use of self-talk strategies has proven effective for enhancing task performance, and preliminary evidence from self-reports suggests that the effectiveness of self-talk can be partly attributed to attentional mechanisms. The purpose of the present investigation was to examine the effects of self-talk strategies on different attention functions, namely, alertness, vigilance, focused, selective, divided, and spatial attention. A between-subjects experimental design was adopted. Six experiments were conducted involving 217 (109 males and 108 females) participants (mean age 21.18 ± 2.20 years), assigned into experimental and control groups. A five-session protocol was implemented including baseline testing, training intervention, and final assessment. The Test Battery for Perception and Attention Functions from the Vienna Test System was used to assess attention functions. The analysis showed that in all experiments, in 16 out of 17 tests, the experimental groups had faster reaction times than the control groups, and a meta-analytic synthesis of the results showed a large effect size (d = 0.91). The findings suggest that self-talk benefit the attention functions and support postulations for an attentional interpretation of the facilitating effects of self-talk strategies on task performance.

Keywords: self-instruction, self-regulation, self-talk mechanisms, attention and perception function

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Self-talk strategies for performance enhancing purposes have received considerable research attention in the contemporary sport and performance psychology literature (for a review, see Theodorakis, Hatzigeorgiadis, & Zourbanos, 2012). Self-talk strategies have been described as the planned use of self-directed cues that aim at enhancing performance through the activation of appropriate responses (Hatzigeorgiadis, Galanis, Zourbanos, & Theodorakis, 2014). Interventions involving self-talk strategies in sport have been applied in a variety of settings and samples, and involving different tasks and outcome measures. In particular, Hatzigeorgiadis et al. (2014) identified four levels of tasks/outcomes where self-talk interventions with athletes have been implemented: (a) fundamental motor tasks (e.g., vertical jump, Edwards, Tod, & McGuigan, 2008), (b) performance components (e.g., tennis volleying, Landin & Hebert, 1999), (c) sport performance in non-competitive context (e.g., cross-country running, Weinberg, Miller, & Horn, 2012), and (d) competitive sport performance (e.g., swimming, Hatzigeorgiadis et al., 2014). Overall, the empirical evidence has provided robust support for the effectiveness of self-talk intervention in facilitating learning and enhancing performance. A meta-analysis of the relevant studies (Hatzigeorgiadis, Zourbanos, Galanis, & Theodorakis, 2011) has revealed a moderate effect size (d = .48). Importantly, the results of the meta-analysis supported the hypothesis that different types of cues may be more effective for different tasks (fine versus gross) and different levels of mastery (novel versus learned), thus supporting the idea that self-talk strategies may influence performance through different mechanisms, which may however operate in tandem (Hardy, 2006). Research on the self-talk mechanisms will forward theory for the understanding of

self-talk effectiveness for performance and inform practice through the development of effective self-talk interventions.

Attempting to understand how language through self-instruction can help self-regulation, Luria (1969) argued that inner speech assists the identification of action goals and the organization of temporal relations between stimuli and subsequent motor responses. Meichenbaum (1977) in his seminal approach to cognitive behavior modification, suggested that self-instructions influence individuals' attentional processes, thus regulating behavioral performance. In developing a sport specific model of self-talk, Van Raalte, Vincent and Brewer (2016) adapted Kahneman's (2011) dual-processing theory to explain how self-talk works, mostly in relation to the origins of self-talk. They identified (a) an intuitive type of self-talk (System I self-talk) that is spontaneous and reflects awareness of current situation and immediate, frequently emotionally charged, reactions to a situation, and (b) a rational type of self-talk (System II) which is based on reason. They postulated that System II self-talk, which incorporates strategic self-talk, required mental effort, plays a role in self-monitoring and can help directing attention. Considering the attentional role of self-talk, Moran (2009) argued that self-statements may enhance attentional skills by reminding individuals on what to focus on in a given situation. Hardy, Oliver, and Tod (2009) proposed a conceptual model for the study of self-talk in sport and suggested four clusters of mechanisms that may explain the effects of self-talk on performance: cognitive, motivational, affective, and behavioral. Cognitive mechanisms refer to the attentional control, concentration and information processing. Motivational mechanisms refer to the role of effort and persistence and are based on self-efficacy theory. Affective mechanisms refer to the regulation of affective states, in particular anxiety. Finally, behavioral mechanisms refer to the improvement of

movement patterns and technique as a possible explanation for performance enhancement. Among the potential mechanisms explaining the effects of self-talk on performance, attention has been identified as a pertinent one (Hardy et al., 2009; Hatzigeorgiadis, Theodorakis, & Zourbanos, 2004).

Preliminary evidence regarding the proposition that self-talk can benefit attention have emerged from studies manipulating attentional focus through self-talk strategies. Ziegler (1987) reported that a four-step self-talk strategy, each reflecting appropriate attentional focus for different phases of a motion, improved performance in tennis groundstrokes, and suggested that self-talk helped shifting the focus of attention between narrow external and broad external. Landin and Hebert (1999) and Mallett and Hanrahan (1997) also postulated that self-talk enhanced performance in tennis and sprinting tasks respectively through the facilitation of attentional focus. However, in none of these studies attentional effects were actually assessed, but inferred through the performance outcomes. Further evidence has been provided from athletes' post experimental self-reports. Van Raalte, Brewer, Rivera, and Petitpas (1994) reported that positive self-talk helped young tennis players to increase their concentration during the competition, whereas in a study by Jonhson, Hrycaiko, Johnson, and Halas (2004) female soccer players reported that self-talk cues helped them focusing their attention on relevant cues. Finally, in a study assessing the potential functions of self-talk, participants in experimental water-polo task rated the attentional function as the most pertinent one, regardless of the type of self-talk used (Hatzigeorgiadis, Zourbanos, & Theodorakis, 2007).

Finally, clearer evidence regarding an attentional interpretation of self-talk effectiveness has been provided by two studies assessing attentional variables in relation to performance. Hatzigeorgiadis et al. (2004) examined the effects of

instructional and motivational self-talk cues on interfering thoughts and performance through a precision and a power water polo task. The results revealed that both self-talk types reduced the occurrence of interfering thoughts in both tasks, and importantly, reductions in interfering thoughts were related to increases in performance. The authors postulated that self-talk may enhance performance through increases on concentration, achieved by the reduction of such internal distractions. Bell and Hardy (2009) examined the effects of different attentional foci on the performance of skilled golfers. The results showed that internal and external focus self-talk led to enhanced internal and external focus of attention. Overall, the above evidence provides a strong basis for further considering the beneficial effects of self-talk on attentional processes.

Nonetheless, it should be noted that the above evidence rely on participants' self-reports. Nisbett and Wilson (1977) argued that individuals cannot accurately report on complex cognitive processes underlying their behavior, thus often basing their responses on a priori hypotheses. Ong (2015) identified the overreliance on self-report measures in sport psychology and suggested that alternative forms of measurement are warranted, whereas Baumeister, Vohs, and Funder (2007) argued for the need to forward assessment of inner processes that mediate actions, and overt behavioural responses as indicators of mental phenomena. From a methodological perspective, Giacobbi, Poczwardowski, and Hager (2005) introduced the 'dominant-less dominant' approach, claiming that among different available methods to research phenomena the use of less prevailing approaches will provide researchers with a wider and more holistic perspective of the athlete's psychological states. They argued for the definite value of utilizing alternative methods in addition to self-report

methods, as this helps accumulating diverse range of data, thus providing ta deeper understanding of individuals and phenomena.

Towards this direction Zhu (2012) stressed the potential of technology-based assessment to measure dynamic and intricate constructs and skills that were previously impossible to measure directly, thus countering limitations associated with traditional measurement methods. The Vienna Test System (VTS, Schuhfried GmbH, 2012), is a valid and reliable instrument assessing psychological and cognitive abilities, such as reaction, attention, spatial orientation, anticipation, peripheral perception, visuomotor coordination, and psychomotor ability. Ong (2015) argued that transferred to the context of sport psychology there is great potential in using computerized tests like the VTS to examine psychological aspects such as attention deficits, stress, burnout, and motivation.. In sport, the VTS has been used to identify differences between athletes and non-athletes, between athletes from different levels within the same sport, and between athletes from different sports. It has also been used to investigate the effects of certain factors (e.g., overtraining and stress) on the psychological and cognitive performance of athletes (for a review, see Ong, 2015). With regard to athletes of different levels, athletes competing at higher levels have been found to perform better than athletes competing at lower levels in various assessments, such as cognitive and motor reaction time (Johne, Poliszczuk, Poliszczuk, & Dabrowska-Perzyna, 2013), spatial orientation, movement coupling, and determination (Gierczuk et al., 2012). With regard symptoms of overtraining, there is evidence that overtrained athletes display lower performance on visuomotor coordination (Paul, Khanna, & Sandhu, 2011) and psychomotor abilities (Paul, Khanna, & Sandhu, 2012). Finally, in a recent study involving attention, Lautenbach,

Laborde, Putman, Angelidis, and Raab (2016) found that negative emotional stimuli impair performance in an attention task.

One of the constructs the VTS assesses is attention functions based on the conceptualization of Sturm (2005). Sturm based on the theoretical frameworks by Posner and Boies (1971) and van Zomeren and Brouwer (1994) suggested three dimensions of attention: intensity, selectivity, and spatial attention. The intensity dimension of attention, comprising alertness and sustained attention/vigilance refers to a state or readiness or preparedness to respond to a certain stimuli. Alertness, which has been described as a reaction to a momentary stimuli (e.g. starting gun) or execute a certain act (returning a serve in tennis), has been inherently linked to arousal (Abernethy, 1993) and consists the basic component of all attention functions, which has been traditionally researched through the reaction time paradigm (ref). Vigilance which refers to the ability to maintain sufficient sensitivity and remain alert to environmental stimuli is important in long duration sport, such as fast-ball sports (e.g., tennis, soccer, rugby, hockey), or in situations of infrequent active participation in a game, such as goalkeeping. In such instances lapses that may occur, which can be linked to lowered arousal (Magill, 1989) can result in crucial miss or delayed responses to important stimuli.

The selectivity dimension comprises three interrelated subdomains referring to the executive aspect of attention (van Zomeren & Brouwer, 1994), selective, focused and divided attention. Focused attention, refers to the ability of a person to isolate a certain fragment of the environment for some time in order to analyze it, while ignoring all the other distractive stimuli. Athletes often acknowledge getting distracted from internal processes (e.g., ruminate over previous mistakes) or external stimuli (e.g., crowd noise and disturbance by opponents), thus losing their focus on

appropriate for action stimuli. Moran (1996) argued for the detrimental effects of distraction to performance. Research on the effects of distractions to performance is scant, however supporting the negative effects of internal (Eubank, Collins, & Smith, 2000; Hatzigeorgiadis & Biddle, 2001) and external (Janelle, Singer, & Williams, 1999) distractions on attentional processes and sport performance. Regarding selective attention, the ability to focus on certain features of a task instead of others at a specific point in time is a key component of successful performances in sport (Abernethy, 1988). For example, in basketball a defender trying to anticipate the direction of the attacking player should select focusing attention on the opponent's waist, rather than the head. There is considerable evidence that skilled athletes can more efficiently select attending appropriate stimuli compared to less-skilled athletes (e.g., Vaeyens, Lenoir, Williams, Mazyn & Philippaerts, 2007). Regarding divided attention, the ability to consider simultaneously two or more sources of information can also have an important role in sport. For example, in table tennis trying to anticipate a serve, important information can be obtained from different sources such as the motion of the upper body and the arms of the server, but also the swing and the angle of the racket. Research in sport has identified the importance of divided attention in field experiments such as in basketball (Furley, Memmert, & Heller, 2010) and handball (Memmert, & Furley, 2007).

Finally, spatial attention, which reflects the orienting aspect of attention (van Zomeren & Brouwer, 1994), refers to the ability to enable the orientation towards relevant external stimuli, which is of particular importance especially in team ball sports, where the movement of teammates and opponents in space is crucial for a player's decision on how to move or pass the ball. Research on peripheral vision has indeed supported the importance of spatial attention in self-paced (e.g., long-jump,

Eves, Gillham, Challis, Shepherd, & Li, 1996), dynamic (successful anticipation in tennis; Huys et al., 2009), and complex (soccer, Williams, & Davids, 1998) sport tasks.

Research in sport psychology has provided preliminary evidence suggesting the self-talk enhances attentional processes, however, to our knowledge there are no studies testing objectively the effect of self-talk strategies on attentional functions. The VTS could help forwarding research investigating cognitive processes in relation to self-talk, in particular with regard to an information processing approach to the cognitive mechanism as identified by Hardy et al. (2009). The purpose of the present study was to investigate the effect of self-talk strategies on the different attention functions, with the use of the VTS based on the Sturm's (2005) taxonomy. Overall, six experiments were conducted including a variety of tests for the assessment of each attentional function, based on accuracy of responses and reaction time. Considering the conceptual assumptions and the preliminary findings presented above, we expected that the use of self-talk cues following a self-talk intervention would improve attentional performance for all the attention functions.

Method

Apparatus

The Test Battery for Perception and Attention Functions (WAF tests, Sturm, 2006) of Vienna Test System (VTS, Schuhfried) was used to assess attentional performance. The VTS comprises six tests (WAF tests) assessing attention functions corresponding to the dimensions described by the conceptualization of Sturm (2005). Evidence for the psychometric integrity for the WAF tests as measures of attention functions has been provided through evidence of convergent and discriminant

validity, but also reliability, in children, young and older adults (Häusler & Sturm, 2009; Sturm, 2006). The WAF tests so far have been mostly used in neuropsychology, in healthy participants (Clemens , Zvyagintsev, Sack, Heinecke, Willmes, & Sturm, 2013), but also neurological patients (Fuermaier et al., 2016; Schock, Schwenzer, Sturm & Mathiak, 2011). Stimuli were presented on a 20-in LCD widescreen computer monitor with screen dimensions of 1280x720 pixels. Participants were entering their responses on a designated panel (Universal response panel, Schuhfried); headphones were used for tests involving auditory stimuli.

Sampling and participants

Power analysis (G*Power 3.1.9.2) was used to calculate the number of participant required to achieve a minimum power of .80, based on an estimated effect size of .90. This effect size was estimated considering (a) the effect size identified in the meta-analysis (Hatzigeorgiadis et al., 2011) for studies where fine tasks requiring attention were used and self-talk training was implemented (d= 1.03), and (b) preliminary pilot tests, and eventually the results from the first experiments of this series (0.80). The analysis showed that a minimum of 16 participants per group were required.

Previous studies implementing self-talk interventions (e.g., Hardy, Hall, Gibbs, & Greenslade, 2005) have shown that larger pools of participants may be required because manipulation checks shown that (a) occasionally, participants of the control group may consistently use self-talk strategies; and (b) rarely, participants of the experimental group fail to use the self-talk strategy as instructed; in which case these participants are excluded to maintain the integrity of the experimental manipulation. The manipulation checks are described in the procedures and the

outcomes of these checks, along with information for participants in each experiment, are described in Appendix 1. Overall, 217 (109 males and 108 females) physical education and sport science students (mean age 21.18 ± 2.20 years) were included in the six experiments, following the screening based on the manipulation checks. None of the participants had previous experience with the Vienna Test System. For their participation they received course credit.

Procedures

Permission to conduct this research was obtained by the institution's ethics committee (ref: 696). All experiments were completed over five sessions on five consecutive days: baseline assessment (session 1), training program (session 2 - 4), and final assessment (session 5). A between subjects design was adopted to test for difference on attention functions between experimental and control groups; however to control for baseline individual differences, a short and similar test was applied before the onset of the intervention. The decision for a between subjects design was made to prevent learning effects, as participants had no prior experience in the tests, but also to prevent the development of self-talk strategies by participants in the control group.

Session 1: Baseline assessment. Participants received information for the requirements of the experiment and signed a consent form. Subsequently, the baseline assessment took place. The purpose of the baseline test was (a) to examine participant's perceptual ability, necessary for the completion of the main tests, and (b) to control for differences on perceptual functions at baseline. All participants were tested individually in specifically designated soundproof room. Two pre-tests (WAFW, pre-test for perceptual functions) were implemented one involving visual

and one involving auditory stimuli. Participants were introduced to the tests through standard computerized instructions that were presented on the monitor for both groups. Participants were told that they should react to the appropriate stimuli by pressing the appropriate button, and that both the correctness and the reaction time would be recorded for each response.

Session 2-4: Training program. Following the completion of the baseline assessment, participants took place in a 3-day training program. Following the protocol of previous studies (Hatzigeorgiadis et al., 2007), the training was implemented on a task different than the final task to prevent learning effect. In particular, the training involved a dart task that was introduced to participants as attention training. Steel-tipped darts were supplied to all participants and regulation distance (2.37 m) and height (1.73 m) were adhered to. A dart board scored from 1 (outer circle) to 10 (center) was used with participants instructed to aim at the center of the board. For every training session, each participant performed 12 sets of five throws. All participants received instructions regarding the technical aspects of the throw (body position, grip, throwing technique, focus). Participants of the control group received in addition a 5min presentation on aspects of coordination and performance related to dart throwing. Participants of the experimental group were given a 5min presentation on the use of self-talk cues and were instructed to use specific cues before each throw, either overtly or covertly according to their preference. They were explained as to what to say (the cue word), when to say it (just before the throw), and why to say it (what function it serves; e.g., to improve focus, to increase readiness). The purpose of the training was to get participant understand, learn, and practice how to use the self-talk technique thoroughly, thus getting familiar and comfortable with using self-talk (the strategy, rather than the use of specific cue-

words), and subsequently use it consistently during the final assessment. For this reason a variety of different cues was practiced. In particular, six self-talk cues were used in the three training sessions, one for every six sets (steady shoulder, aim, follow-through, I can do it, let's go, ready). A manipulation check for the use of self-talk in training was applied to participants of the experimental group (see Appendix 1). The duration of each training session was 20 minutes.

Session 5: Final assessment. On the fifth day, the final test was administered. Participants were introduced to the tests through standard computerized instructions that were presented on the monitor for both groups. Participants were told that they should react to the appropriate stimuli by pressing the appropriate button, and that both the correctness and the reaction time would be recorded for each response. Participants of the experimental group were instructed for the use of self-talk cues, in a pattern similar to that of the training (what to say, when to say it, why to say it). After the completion of the final assessment a standard manipulation check protocol (Hardy et al., 2005; Hatzigeorgiadis et al., 2014) regarding the use of self-talk was administered to participants of the experimental and the control group to ensure the integrity of the experimental conditions (see Appendix 1). The details of the test for each experiment are presented below (for a more detailed presentation of the tests see Appendix 2). A series of pilot trials preceded the experiments to test the effectiveness of different self-talk cues before deciding the most appropriate ones for each experiment. The purpose of the self-talk cues used in the final assessment was to trigger, or direct attention to appropriate stimuli, thus initiating appropriate reaction in relation to the demands of each test.

Experiment 1: The first experiment examined alertness through three visual and three auditory sub-tests. The visual sub-tests consisted of: (a) intrinsic visual (a

simple visual reaction time task without warning stimuli), (b) phasic unimodal visual (a simple visual reaction time task preceded by an external visual warning stimulus), (c) phasic cross modal visual/auditory (a simple visual reaction time task preceded by an external auditory warning stimulus). The auditory sub-tests consisted of: (a) intrinsic auditory (a simple auditory reaction time task without warning stimuli), (b) phasic unimodal auditory (a simple auditory reaction time task preceded by an external auditory warning stimulus), (c) phasic cross modal auditory/visual (a simple auditory reaction time task preceded by an external visual warning stimulus). In all subtests participants were asked to react whenever the targeted stimulus (shape or sound) appeared. For the intrinsic subtests participants of the experimental group were instructed to use the instruction 'ready' immediately after each response to prepare for the next stimuli, whereas for the phasic subtests they were asked to use the instruction 'ready' on the appearance of the warning stimuli, to increase awareness for the reaction. The duration of each sub-test was approximately four minutes.

Experiment 2: The second experiment examined vigilance through a visual test. Participants were asked to react to changes in a particular stimulus (shape) that appeared with a low rate. Participants of the experimental group were instructed to use the instruction 'ready' on the appearance of the stimulus, to increase awareness for reacting in case the targeted change occurred. The duration of the test was approximately thirty minutes.

Experiment 3: The third experiment examined selective attention through a visual and an auditory sub-test. In both sub-tests participants were asked to attend to changes in three stimuli (shapes or sounds) and react when changes occurred in two of those stimuli, while ignoring changes to other stimulus. Participants of the experimental group were instructed to use the instruction 'ready' on the appearance of

the stimuli, to increase awareness for the reaction, and the instruction 'false' when changes occurred to irrelevant stimulus, to relax their attention. The duration of each sub-test was approximately ten minutes.

Experiment 4: The fourth experiment examined focused attention through a visual, an auditory, and an audiovisual sub-test. In all sub-tests participants were asked to attend sequence of changes to two stimuli (shapes or sounds) and to react to when consequent changes occurred to a particular stimulus. Participants of the experimental group were instructed to use the instruction 'ready' on the first occurrence of the targeted change to increase awareness for the reaction, and the instruction 'false' when changes occurred to irrelevant stimuli, to relax their attention. The duration of each sub-test was approximately ten minutes.

Experiment 5: The fifth experiment examined divided attention through a visual and an audiovisual sub-test. In both sub-tests participants were asked to attend sequence of changes to two stimuli (shapes or sounds) and to react when consequent changes occurred on any of these stimuli. Participants of the experimental group were instructed to use the instruction 'ready' on the first occurrence of the targeted changes to increase awareness for the reaction, and the instruction 'false' when changes occurred to irrelevant stimulus, to relax their attention. The duration of each sub-test was approximately 15 minutes.

Experiment 6: The sixth experiment examined spatial attention through three visual sub-tests: (a) central spatial cues (endogenous – warning stimuli are presented in the middle of the monitor), (b) peripheral spatial cues (exogenous – warning stimuli are presented in the periphery of the monitor), and (c) neglect (extinction condition – stimuli are presented at various positions in the left or right visual field). In the central spatial cues sub-test participants were asked to react to a particular change (change of

color to black) occurring to shapes (triangles) appearing in a circular fashion around the center of the screen. Participants of the experimental group were instructed to use the instruction 'black' immediately after each response to prepare for the next stimuli. In the peripheral spatial cues sub-test participants were asked to react to a particular change (change of color to black) occurring to shapes (triangles) appearing in a circular fashion around the center of the screen, while ignoring other changes (triangles circled in red circles). Participants of the experimental group were instructed to use the instruction 'black' immediately after each response to prepare for the next stimuli. Finally, in neglect sub-test participants were asked to react whenever stimuli (circles) appeared on the screen. Depending on which half of the screen the stimuli appeared, participants were asked to push the respective buttons (left, right, or both). Participants of the experimental group were instructed to use the instruction 'ready' immediately after each response to prepare for the next stimuli. The duration of the first two sub-tests was approximately ten minutes and for the third sub-test was five minutes.

Results

Analyses of covariance, with final measures as dependent variables and baseline measures as covariates, were calculated to test for differences between the experimental and the control groups, on reaction time and percentage of correct responses for the six experiments. Descriptive statistics for reaction time and percentage of correct responses in the final tests, along with the univariate F statistics, for all experiments are presented in Table 1.

Experiment 1. For the six subtests of alertness, MANCOVA for percentage of correct responses revealed no significant differences between the two groups, F (6,

37) = 0.86, p = .53, whereas MANCOVA for reaction time revealed significant differences between the two groups, F (6, 37) = 2.56, p = .03, η2 = .29.

Experiment 2. For the test of vigilance, ANCOVA for percentage of correct responses revealed no significant differences between the two groups, F (1, 37) = 0.56, p = .45, whereas ANCOVA for reaction time revealed significant differences between the two groups, F (1, 37) = 9.28, p = .00, η2 = .23.

Experiment 3. For the two subtests of selective attention, MANCOVA for percentage of correct responses revealed no significant differences between the two groups, F (2, 32) = 1.68, p = .20, whereas MANCOVA for reaction time revealed significant differences between the two groups, F (2, 32) = 3.45, p = .04, η2 = .17.

Experiment 4. For the three subtests of focused attention, MANCOVA for percentage of correct responses revealed no significant differences between the two groups, F (3, 29) = 0.22, p = .87, whereas MANCOVA for reaction time revealed significant differences between the two groups, F (3, 29) = 3.04, p = .04, η2 = .24.

Experiment 5. For the two subtests of divided attention MANCOVA for percentage of correct responses revealed no significant differences between the two groups, F (2, 30) = 2.33, p = .13, whereas MANCOVA for reaction time revealed significant differences between the two groups, F (2, 30) = 5.05, p = .01, η2 = .25.

Experiment 6. Finally, for the three subtests of spatial attention MANCOVA for percentage of correct responses revealed no significant differences between the two groups, F (3, 29) = 0.55, p = .64, whereas MANCOVA for reaction time revealed significant differences between the two groups, F (3, 29) = 4.73, p = .00, η2 = .33.

Meta-analysis

A meta-analytic synthesis of the results was conducted (Review Manager 5.3) to identify the overall effect size and explore differences in effect size as a function of attention domain, attention dimension, and mode of stimuli (visual, auditory, mixed). The analysis revealed an overall effect (d) of 0.91, while no heterogeneity was observed (95CI: 0.75, 1.08, I2:0.00). Expectedly, no significant differences in effect size were observed, as these evolved from the confidence intervals, for any of the examined moderators. The results of the meta-analysis are presented in Table 3.

Discussion

Self-talk strategies have been found effective in improving motor and sport performance and attention has been claimed as a potential mechanism explaining the performance enhancing effects of self-talk (Hardy et al., 2009). The present study examined the effect of a self-talk intervention on the different attention functions, as these described by Sturm (2005), through objective behavioral measures. The results provided consistent support for the positive effects of self-talk on reaction time in attention functions through a series of experiments involving multiple measures. The replicability of the findings strengthens our confidence in the identified effect. Previous research in sport and performance psychology has provided preliminary evidence regarding the attentional effects of self-talk, mostly through self-reports of enhanced focus of attention (Bell & Hardy, 2009), and reduced internal distraction (Hatzigeorgiadis et al., 2004). The present findings provide more direct evidence for the beneficial effects of self-talk on different attention functions.

The results in the six experiments showed that the experimental groups produced better reaction times but not higher percentages of correct responses.

Glickman, Gray, and Morales (2005) argue that to infer a meaningful performance effect, a positive effect should be identified either in both accuracy (improved) and reaction time (reduced), or a positive effect in one, but not in the other, as sometimes a speed-accuracy tradeoff occurs, with participants sacrificing speed to enhance accuracy, or sacrifice accuracy to enhance speed. The present findings suggest that the reaction time effect was meaningful, as faster reaction times produced by the experimental group were not at the expense of correctness.

Van Ede, de Lange, and Maris (2012) identified that the two most-studied behavioral consequences of attentional cueing (perceptual accuracy increase, reaction time decrease) follow dissimilar time courses. They argued that the dissociation between accuracy and reaction time following a manipulation of voluntary attention implies that distinct cognitive processes underlie the different behavioral consequences of symbolic cueing. Van Ede et al. (2012) went on to propose that attentional cues can affect response accuracy and reaction time via different cognitive processes; a preparatory, that occurs before the target and affects both accuracy and reaction time, and a non-preparatory, that occurs after the target and affects reaction time only. The present findings showing that the attentional manipulation yielded a significant effect to reaction time but not to accuracy of responses could be possibly attributed to the different processes involved. Future research should investigate whether self-talk affects the level of activation of these processes through neurophysiological measures. In addition, it would interesting for future studies to test whether self-talk can assist accuracy of response in more demanding tasks, or under states of depleted self-control that deteriorate attentional performance (Hagger, Wood, Stiff, & Chatzisarantis, 2010).

The meta-analytic synthesis of the results showed a large effect size for reaction time. This is in accordance with the results from the meta-analytic study by Hatzigeorgiadis et al. (2011) who reported large effect sizes for fine tasks, for novel tasks, and for studies where participants had received training on the use of self-talk. In addition, no differences were identified for the different domains and dimensions of attention, nor for the type of the stimuli. Considering the lack of evidence to support a priori hypotheses our purpose was to explore the potential regulatory function of these variables in the study. That none of these moderators proved significant suggests that self-talk may equally benefit reaction time performance in attentional tasks.

The findings support assumptions and preliminary evidence based on self-reports suggesting the attentional underpinnings of self-talk effectiveness. Hardy (2006), based on earlier theorizing from Landin (1994), suggested an attentional interpretation and an information processing interpretation that were subsequently presented by Hardy et al. (2009) as the cognitive mechanism of self-talk. Regarding the focus of attention, Bell and Hardy (2009) provided evidence that internal and external focus self-talk led to greater internal and external focus of attention. In addition, indirect evidence regarding enhanced focus have been reported by Hatzigeorgiadis et al. (2004) who found that self-talk reduced interfering thoughts during task performance. The present findings attest for the information processing perspective through direct measures of attentional performance. Considering Wrisberg's (1993) proposition regarding the perceptual processing, decision processing, and effector processing, the results suggest in particular an effector processing interpretation, linked to the initiating movement sequences. Yet, appropriate designs to empirically support the mediating role of attention as a

mechanism explaining the facilitating effects of self-talk on performance is warranted in future research.

The present findings reinforce previous findings regarding the attentional effects of self-talk through objective behavioral measures. Attention functions have been recognized as important elements of sport performance, as research in lab and field experiments has shown that more proficient athletes display higher levels of attention functions (Johne et al., 2013; Vaeyens et al., 2007). In addition, tactical performance and in particular anticipation skills can be significantly improved by directing attention to appropriate stimuli (Hagemann et al., 2006). Self-talk strategies can be used as cues triggering or directing attention thus enhancing attentional performance. Therefore, self-talk based attention training programs, adjusted to address individual needs and attention related sport requirements may help athletes improving attentional functioning. Nevertheless, to further support our confidence in these implications, field research should be sought. The present investigation adopted a basic research approach to explore the effect of self-talk on attention functions. The choice for this type of research limits the external validity of the findings; however the use of objective behavioural measures in controlled laboratory environment, in combination with the consistent replicability of the results, provides strong indications regarding the attentional effects of self-talk. Future research should employ field experiments and make use of sport tasks in conditions that will support the ecological validity of the present findings.

Two more issues pertaining to the limitations of this study should be addressed. First, the issue of excluding control participants from the sample to maintain the experimental integrity. People intuitively talk to themselves when performing, and some of this self-talk may be systematic and serving a purpose (i.e.

strategic self-talk). In the self-talk literature, the use of manipulation checks for self-talk is crucial to protect the integrity of the experimental conditions (Hardy, Hall, Gibbs and Greenslade, 2005). In self-talk studies using manipulation checks, participants have been excluded for reporting using strategic self-talk while in a control condition (Hatzigeorgiadis, Zourbanos, Goltsios, & Theodorakis, 2008), reporting not using self-talk while in an experimental condition (Hatzigeorgiadis, Zourbanos, Mpoumpaki, & Theodorakis, 2009), or reporting some other type of strategic self-talk, rather than the one instructed (Hardy, Begley, & Blanchfield, 2011). To prevent the loss of participants in experimental groups Hardy, Hall, Gibbs and Greenslade (2005) argued that manipulation checks should not be used in baseline measures, because this may raise awareness of one's processes and eventually may induce the use of self-talk in later assessments. In addition, to prevent the loss of experimental participants Hatzigeorgiadis et al. (2014) argued that training experimental participants using self-talk will enhance the possibility of these participants using self-talk as instructed. In the present study, on one hand, participants of the self-talk conditions were trained to use self-talk, and they reported using self-talk consistently. On the other hand, a number of participants in the control conditions reported using consistently self-talk, despite not exposed to relevant stimuli. It is noticeable, that the number of participants using self-talk is greater than in previous studies (e.g., Edwards et al., 2008. Hatzigeorgiadis et al., 2008), however, there is other studies that have reported large numbers of control participants (greater than 50%) using self-talk (e.g., Hardy Hall, Gibbs & Greenslade, 2005; Theodorakis, Weinberg, Natsis, Douma, & Kazakas, 2000). In this study, the relatively large percentage of control participants reporting using self-talk can be attributed to the nature of the task, during which it is possible that participants developed self-talk

strategies as they identify that this will facilitate their performance, and used them consistently.

Another issue that should be noted is that the present research cannot rule out the possibility of additional explanations for the attention effects. Hardy (2006) argued that using self-talk cues may activate different mechanisms, operating in tandem (Hardy, 2006). There is also self-reported evidence suggesting that using for example an motivational self-talk will also improve attention (e.g., Hatzigeorgiadis et al., 2004), and respectively using an instructional cue may enhance drive (Hatzigeorgiadis, 2006). However, there is also evidence that using an instructional cue will mostly influence attention and using motivational cues will mostly enhance drive/effort (Hatzigeorgiadis et al., 2007), and this had led to the development of the matching hypothesis (Theodorakis et al. 2000). The purpose in this research was to direct attention to appropriate stimuli and increase response readiness. The cue words were chosen to serve this purpose based on extensive piloting. Nevertheless, the use of self-talk may have influenced additional mechanisms, such as motivation, and in particular arousal, which have been closely linked to alertness and attentional performance (Abernethy, 1993).

The present study has useful implication for research, theory and practice. The findings provide valuable evidence supporting postulations that self-talk has a strong attentional effect. Thus, a new line of research is introduced that can help exploring different hypotheses regarding attentional mechanisms, through the use of different methodologies, in particular with regard to neuropsychological assessments. Importantly, designs allowing the examination of mediation hypotheses, but also field studies to support the ecological validity of the findings are warranted. With regard to theory, the present findings add valuable knowledge towards the development of a

comprehensive theory explaining the effectiveness of self-talk strategies in performance and other achievement contexts, highlighting the importance of cognitive processes. Finally, with regard to practice, considering that self-talk strategies need to be tailored to suit personal and situational characteristics, the present findings can inform the development of effective interventions based on the cognitive demands of the task and individual differences in attentional processing.

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Appendix 1. Manipulation checks

Manipulation check for self-talk in training

After the completion of each training session participants of the experimental group were asked to report on a 10-point scale how frequently they use the instructed self-talk cues (1= not at all, 10= all the time) over the entire session. No manipulation check was used for participants of the control group at this stage to prevent raising awareness for the purpose of the experiment, thus inflicting the use of self-talk. Examination of the mean scores for this manipulation check showed that participants of the experimental groups made adequate use of self-talk during the training sessions (means for the six experiments ranging from 8.68 to 9.40).

Manipulation check for self-talk in the final test

Participants of the experimental groups were asked to report on a 10-point scale (1= not at all, 10= all the time) the degree to which they used self-talk cues according to the instructions. Participants of the control groups were asked to report (a) whether they consistently used any particular strategy or gave themselves specific instructions during the trial, (b) if so, what was that strategy or instruction; and (c) if so, to report on a 10-point scale (1= not at all, 10= all the time) the degree to which they used this strategy or instruction.

For the experimental groups examination of the mean scores showed that in all experiments participants made adequate use of self-talk during the final assessment (means for the six experiments ranging from 8.42 to 9.35; all participants reporting use of self-talk equal or greater than 7 on the 10-point scale).

For the control groups the screening showed that four out of the 29 participants in experiment 1, two out of the 19 participants in experiment 2, nine out

of the 27 participants in experiment 3, ten out of the 27 in experiment 4, nine out of the 26 participants in experiment 5, and four out of the 21 participants in experiment 6, reported consistent use of some form of strategic self-talk, with frequency equal or greater than 7 on the 10-point scale, and were removed from subsequent analyses. Information for participants in each experiment is presented in Table 3.

Appendix 2. Information on the WAF tests

Alertness

Intrinsic visual and auditory tests. For the intrinsic visual subtest a circle appeared on the screen. Participants were asked to press the button as quickly as they could after a circle appeared. For the intrinsic auditory subtest a sound was heard through the headphones. Participants were asked to press the button as quickly as they could after a sound was heard. Each subtest lasted approximately four minutes.

Phasic unimodal visual and auditory tests. For the phasic unimodal visual subtest a circle appeared on the screen just after a square. Participants were asked to press the button as quickly as they could after a circle appeared. For the phasic unimodal auditory test a high-pitched sound was heard just after a low sound through the headphones. Participants were asked to press the button as quickly as they could after hearing the high-pitched sound. Each subtest lasted approximately four minutes.

Phasic crossmodal visual and auditory test. For the phasic crossmodal visual subtest a circle appeared on the screen just after a short sound was heard through the headphones. Participants were asked to press the button as quickly as they could after the circle appeared on the screen. For the phasic crossmodal auditory test a sound was heard through the headphones just after a circle appeared on the screen. Participants were asked to press the button as quickly as they could after hearing the sound. Each subtest lasted approximately four minutes.

Vigilance

For this subtest a gray square appeared on the screen. Rarely, the square turned darker. Participants were asked to press the button as quickly as they could in case the square got darker. The duration of the test was 30 minutes.

Selective Attention

Unimodal visual and auditory. For the unimodal visual subtest squares, circles, and triangles appeared on the screen, in pairs one below the other. Sometimes shapes became lighter or darker. Participants were asked to press the button as quickly as they could when a square or a circle got lighter or darker. For the unimodal auditory subtest low, medium, and high-pitched sounds were heard through the headphones, one at a time. Occasionally, the sound became louder or softer. Participants were asked to press the button as quickly as they could when the low or the high-pitched sound got louder or softer. The duration of the test was 10 minutes.

Focused Attention

Unimodal visual. For this subtest two shapes, circles and squares, appeared on the screen simultaneously one below the other in all possible combinations (i.e., circle/circle, square /square, or square/circle). After the shapes appeared they sometimes became brighter. Participants were asked to press the button as quickly as they could when a circle (in either the top or bottom position) became brighter twice in succession. The duration of the test was 10 minutes.

Unimodal auditory. For this subtest a sound was heard among a babble of voices through the headphones. Sometimes the sound got softer. Participants were asked to press the button as quickly as they could when the sound became softer twice in succession. The duration of the test was 10 minutes.

Crossmodal visual/auditory. For this subtest a square appeared on the screen and at the same time a sound was heard through the headphones. Sometimes the square became brighter and sometimes the sound became softer. Participants were

asked to press the button as quickly as they could when the square became lighter twice in succession. The duration of the test was 10 minutes.

Divided Attention

Unimodal visual. For this subtest a square and a circle appeared on the screen simultaneously, one below the other. Sometimes the shapes got lighter. Participants were asked to press the button as quickly as they could when the same shape got lighter twice in succession. The duration of the subtest was 15 minutes.

Crossmodal. For the crossmodal test a square appeared on the screen and at the same time a sound was heard through the headphones. Sometimes the square got lighter and sometimes the sound got softer. Participants were asked to press the button as quickly as they could when the square got lighter twice in a row or the sound got softer twice in a row. The duration of each sub-test was approximately 15 minutes.

Spatial Attention

8 stimuli positions – central cue. For this subtest 8 triangles were situated in a circular way around a cross in the middle of the screen. Sometimes a triangle got darker. Participants were asked to look straight at the cross in the middle of the screen and press the button as quickly as they could when a triangle got darker. The duration of the sub-tests was ten minutes.

8 stimuli positions – peripheral cue. For this subtest 8 triangles were situated in a circular way around a cross in the middle of the screen. Sometimes a triangle got darker and sometimes a triangle was circled in a red circle. Participants were asked to look straight at the cross in the middle of the screen and press the button as quickly as they could when a triangle got darker. The duration of the sub-tests was ten minutes.

Neglect. For this subtest circles appeared on the left, the right, or both vertical halves of the screen. Participants were asked to press accordingly the button on the left, the right, or both buttons simultaneously. The duration of the sub-tests was five minutes.

Table 1.

Mean Scores and univariate statistics for the final tests.

	Reaction time			% correct responses		
	Experimental	Control	Statistics	Experimental	Control	Statistics
Alertness			*F* (1, 45)			*F* (1, 45)
Visual 1	.205 (±.027)	.228 (±.024)	9.01, *p*= .00, η^2 = .17	97.80 (± 2.04)	98.72 (± 2.15)	1.97, *p*= .16, η^2 = .04
Visual 2	.186 (±.025)	.220 (±.046)	9.40, *p*= .00, η^2 = .18	97.60 (± 2.56)	98.00 (± 3.31)	0.22, *p*= .64, η^2 = .00
Visual 3	.187 (±.030)	.220 (±.039)	8.52, *p*= .00, η^2 = .18	96.90 (± 3.97)	97.68 (± 2.62)	0.57, *p*= .46, η^2 = .01
Auditory 1	.184 (±.022)	.210 (±.032)	8.33, *p*= .00, η^2 = .18	97.40 (± 2.06)	98.32 (± 2.35)	1.91, *p*= .17, η^2 = .04
Auditory 2	.205 (±.126)	.203 (±.030)	0.00, *p*= .92, η^2 = .00	95.20 (± 3.27)	97.12 (± 3.56)	3.90, *p*= .05, η^2 = .08
Auditory 3	.159 (±.031)	.196 (±.036)	13.57, *p*= .00, η^2 = .24	94.80 (± 4.12)	96.40 (± 3.95)	1.72, *p*= .19, η^2 = .04
Vigilance			*F* (1, 34)			*F* (1, 34)
Visual 1	.347 (±.062)	.409 (±.049)	9.28, *p*= .00, η^2 = .23	95.70 (± 6.99)	94.11 (± 9.40)	0.56, *p*= .45, η^2 = .01
Selective			*F* (1, 36)			*F* (1, 36)
Visual 1	.290 (±.047)	.339 (±.075)	5.26, *p*= .02, η^2 = .13	94.16 (± 4.63)	96.00 (± 3.41)	1.92, *p*= .17, η^2 = .05

Auditory 1	.378 (±.088)	.441 (±.087)	4.34, p= .04, η^2 = .11	87.27 (± 7.48)	82.77 (±11.93)	1.38, p= .24, η^2 = .04
Focused			F (1, 34)			F (1, 34)
Visual 1	.301 (±.062)	.383 (±.096)	7.98, p= .00, η^2 = .20	92.76 (± 7.22)	93.41 (± 7.39)	0.00, p= .92, η^2 = .00
Auditory 1	.316 (±.064)	.391 (±.094)	6.70, p= .01, η^2 = .18	94.35 (± 8.28)	93.94 (± 7.43)	0.01, p= .92, η^2 = .00
Cross 1	.250 (±.028)	.311 (±.098)	6.39, p= .01, η^2 = .17	97.58 (± 3.02)	97.11 (± 4.04)	0.54, p= .46, η^2 = .01
Divided			F (1, 34)			F (1, 34)
Visual 1	.379 (±.091)	.504 (±.012)	8.76, p= .00, η^2 = .22	90.29 (± 5.70)	84.64 (± 9.88)	4.34, p= .04, η^2 = .12
Cross 1	.355 (±.079)	.504 (±.167)	8.08, p= .00, η^2 = .20	91.23 (± 6.37)	87.47 (± 8.69)	1.92, p= .17, η^2 = .05
Spatial			F (1, 34)			F (1, 34)
Visual 1	.290 (±.037)	.359 (±.064)	11.01, p= .00, η^2 = .26	96.76 (± 2.30)	96.94 (± 2.16)	0.07, p= .78, η^2 = .00
Visual 2	.293 (±.038)	.357 (±.051)	13.22, p= .00, η^2 = .29	94.82 (± 3.04)	96.00 (± 3.77)	1.07, p= .30, η^2 = .03
Visual 3	.319 (±.036)	.379 (±.057)	10.05, p= .00, η^2 = .24	99.05 (± 1.24)	98.94 (± 1.59)	0.14, p= .71, η^2 = .00

Table 2.

Meta-analysis: Statistics for total effect and moderators.

Moderators and Levels	*k*	*d*	95% CI	T^2	χ^2	*p*	I^2
Overall	17	0.91	-0.75, -1.08	0.00	14.72	.55	0%
Domains of attention							
Alertness	6	0.76	-0.44, -1.09	0.07	8.53	.13	41%
Vigilance	1	1.11					
Selective	2	0.73	-0.26, -1.21	0.00	0.02	.90	0%
Focused	3	0.91	-0.50, -1.32	0.00	0.10	.95	0%
Divided	2	1.13	-0.61, -1.65	0.00	0.00	.95	0%
Spatial	3	1.30	-0.87, -1.73	0.00	0.09	.96	0%
Dimensions of attention							
Intensity	7	0.80	-0.51, -1.10	0.06	9.22	.16	35%
Selectivity	7	0.91	-0.65, -1.18	0.00	1.33	.97	0%
Spatial	3	1.30	-0.87, -1.73	0.00	0.09	.96	0%
Mode of stimuli							
Visual	10	1.03	-0.81, -1.25	0.00	2.87	.97	0%
Auditory	5	0.70	-0.30, -1.11	0.11	7.91	.09	49%
Cross	2	0.97	-0.46, -1.47	0.00	0.31	.58	0%

Note: *k*: number of effect sizes; *d*: Cohen's standardized mean differences; *CI*: confidence interval.

Table 3.

Participant information for all experiments.

	Experimental		Control		Total Final	Mean Age
	Initial	Final	Initial	Final		
Experiment 1	20	20	29	25	45	21.40 (± 3.15)
Experiment 2	17	17	19	17	34	20.15 (± 1.96)
Experiment 3	18	18	27	18	36	21.87 (± 4.31)
Experiment 4	17	17	27	17	34	21.38 (± 1.03)
Experiment 5	17	17	26	17	34	22.49 (± 2.14)
Experiment 6	17	17	21	17	34	19.80 (± 0.61)

CHAPTER 4: SELF-TALK AND DISTRACTIONS

From the lab to the field:

Effects of self-talk on task performance under distracting conditions

[3]

Abstract

This study explored the effectiveness of self-talk strategies on task performance under conditions of external distraction in lab and field experiments. In the lab experiment, 28 sport science students (mean age 21.48 ± 1.58 years) were tested on a computer game requiring attention and fine execution following a baseline assessment and a short self-talk training. In in the field experiment, 28 female basketball players (mean age 20.96 ± 4.51years) were tested on free-throwing, following a baseline assessment and a six-week intervention. In both settings the final assessment took place under conditions of external distraction (non-continuous, sudden, loud noise). Analyses of covariance showed that participants of the self-talk group performed better than participants of the control group. Findings suggest that self-talk can counter the effects of distraction on performance, and indicate that the attentional effects of self-talk is a viable mechanism to explain the facilitating effects of self-talk on performance.

Keywords: attention, auditory distraction, self-talk mechanisms, concentration

[3] *Galanis, E., Hatzigeorgiadis, A., Comoutos, N., Charachousi, F., & Sanchez, X. (2017). From the lab to the field: Effects of self-talk on task performance under distracting condition. The Sport Psychologist. Manuscript in press.*

Self-talk research in sport has flourished due to its direct applied value. It is noteworthy that even the first studies in the sport self-talk literature examined the effectiveness of self-talk strategies on performance (e.g., Rushall, Hall, Roux, Sasseville, & Rushall, 1988; Ziegler, 1987). Self-talk strategies have been described as the instrumental use of self-addressed cues aiming at facilitating learning and enhancing performance through the activation of appropriate responses (Hatzigeorgiadis, Galanis, Zourbanos, & Theodorakis, 2014). There is now considerable evidence regarding the effectiveness of self-talk strategies through the implementation of self-talk interventions in a wide variety of tasks and sports, employing different methodological approaches including, in addition to experimental research, longitudinal interventions (e.g., Perkos, Theodorakis, & Chroni, 2002), single-subject designs (e.g., Hamilton, Scott, & MacDougall, 2007), and case studies (e.g., Latinjak, Font-Llado, Zourbanos, & Hatzigeorgiadis, 2016). More emphatically, two reviews – a systematic review (Tod, Hardy, & Oliver, 2011) and a meta-analysis (Hatzigeorgiadis, Zourbanos, Galanis, & Theodorakis, 2011) – have provided robust support for the valuable effects of self-talk on performance.

Recently, the need to explore the mechanisms explaining the facilitating effects of self-talk has been identified, as the understanding of these mechanisms will help constructing theory and developing more effective interventions (Galanis, Hatzigeorgiadis, Zourbanos, & Theodorakis, 2016). Hardy, Oliver and Tod (2011) proposed a conceptual model describing four dimensions of mechanisms that may explain the effects of self-talk on sport task performance; cognitive, motivational, emotional, and behavioural. Based on preliminary empirical findings, Galanis et al. (2016) elaborated on the motivational and cognitive mechanism, and attempted to forward postulations regarding the attentional functions of self-talk. They argued that

even though research on self-talk mechanisms is still in early stages, there is reasonable evidence suggesting that the effects of self-talk on attention is a key mechanism explaining the effectiveness of self-talk strategies.

The facilitating effects of self-talk strategies on attention have been identified through reports from athletes participating in self-talk interventions (e.g., Landin & Hebert, 1999), case studies (Cutton & Hearon, 2014), and qualitative inquiries (Wayde & Hanton, 2008). Further evidence evolves from experimental studies exploring the effects of self-talk strategies on aspects of attention. Bell and Hardy (2009) examined the effect of self-talk cues fostering either an internal or an external focus of attention on self-reported attentional focus and performance. In relation to attentional focus, the findings showed that participants using self-talk reported higher (either internal or external) attentional focus, in accordance with the cue that was used, compared to the control group. The authors suggested that self-talk can help strengthening attentional focus. Finally, Galanis, Hatzigeorgiadis, Zourbanos, Papaioannou, and Theodorakis (2017), based on Sturm's (2005) conceptualization of attention dimensions, examined in a series of experiments the effects of self-talk on attention functions, namely, alertness, vigilance, focused, selective, divided, and spatial attention, through direct behavioral measures using the Test Battery for Perception and Attention Functions from the Vienna Test System (VTS, Schufried). The results showed that in 16 out of the 17 tests that were performed the experimental groups displayed better attentional performance compared to the control groups. The above findings provide reasonable indications that self-talk may have beneficial effects on attentional performance.

Van Raalte, Vincent and Brewer, (2016), in their self-talk model for sport, address the reciprocal relationship between contextual factors and athletes' self-talk.

They claim that contextual factors can exert an important influence on athletes' self-talk but also that self-talk can help athletes dealing with contextual factors. Furthermore, they stress that research exploring contextual demands in sport shall help developing effective self-talk interventions; such a contextual factor in sport is distraction. Indeed, the ability of athletes to focus attention efficiently and remain focused on the face of distractions has been recognized as an integral part of sport performance (Lidor, 2007). Nelson, Duncan, and Kiecker (1993) described 'distraction' as the occurrence of competing stimuli that may interfere with task-related stimuli and divert attention from its original focus. According to Moran (1996, 2012), these distractions may come from internal as well as external sources. Typical internal sources include factors such as intrusive thoughts (e.g., worrying), emotions (e.g., anger), and even bodily sensations (e.g., fatigue); whereas, external sources include factors such as visual triggers (e.g., crowd movements), auditory triggers (e.g., crowd noises), gamesmanship by opponents (e.g., verbal taunting of opponents), and environmental conditions (e.g., windy whether). In psychology, research on distraction has mostly focused on the effects of external distraction to attention and performance, possibly due to methodological reasons. On the one hand, sources of information coming up from inside (e.g., inner thoughts) have been less examined because of a false perception that information has only one direction, from the outside world inwards; but also due to difficulties related to manipulation and measurement (Moran, 2009). On the other hand, sources of information coming from outside (e.g., environmental conditions) have received more research attention due to methodological convenience of creating and manipulating such distractions (Eysenck & Keane, 1995). Nevertheless, research in psychology has supported that distractions, either internal or external, humper attention and performance in cognitive-motor tasks

(e.g., Coy, O'Brien, Tabaczynski, Northern, & Carels, 2011; Dalton & Behm, 2007; Persoon et al., 2011).

In sport, the role of distractions has been greatly recognized, and can be easily identified in anecdotal reports. In the 1995 Spanish Open golf championship, Eamon Darcy was disturbed by an unexpected loud noise of a mobile phone that went off during his downswing, and he sent the ball 'out of bound'; he then acknowledged that "after the ringing I was upset and actually never got my rhythm back after that". Similarly, in the 1992 Wimbledon tennis tournament, Monica Seles was accused by an opponent for her sonorous grunting during the strokes. Her opponent found such noise distracting because she could not hear the ball leaving Seles' strings. Despite the significant role of distraction for attention and ultimately actual performance, the topic has received relatively limited research interest. Jannelle, Singer, and Williams (1999) examined the effects of visual distraction in a driving simulation task under anxious conditions. They reported that external distractions were associated with attentional narrowing and poor performance in central and peripheral tasks. In a study examining the effects of distractions, Hohmann, Exner, and Schott (2016) investigated the temporal congruence between physical execution and motor imagery in a Timed-Up and-Go-Test type of task, under neutral and auditory distraction conditions. They found that auditory distraction negatively affected mental chronometry.

The ability to focus attention, and remain focused despite distractions is a skill, and as such it can be developed and improved through practice (Wilson, Peper, & Schmid, 2006). To that end, the use of cognitive strategies becomes important. Lidor, Ziv, and Tenenbaum (2013) tested the effectiveness of internal and external focus of attention instructions on a throwing accuracy task, under neutral and

distracting conditions. They reported that under distracting conditions, both external and internal focus instructions groups yielded better accuracy and consistency scores compared to the control group.

Considering the conceptual models (Galanis et al., 2016; Hardy et al., 2009, Van Raalte et al., 2016) and the relevant self-talk literature addressed above, it evolves that self-talk may be an effective strategy to attenuate the detrimental effects of distraction on performance. In fact, a study by Hatzigeorgiadis, Theodorakis, and Zourbanos (2004) provided valuable preliminary evidence for the potential of self-talk strategies to attenuate internal distractions. The authors examined the effects of two types of self-talk (instructional and motivational) on performance in a precision and a power task in water-polo. In addition, the occurrence of internal distractions in the form of interfering thoughts was examined through self-reports immediately after the conclusion of the tasks. Findings revealed that both self-talk types were effective in reducing the occurrence of distracting thoughts in both tasks. Importantly, reductions in interfering thoughts were related to increases in performance, thus suggesting that reduction of distractions, reflecting improvements of attention, may be a viable mechanism to explain the facilitating effects of self-talk.

Considering the importance of attention for sport performance and the detrimental effects of distractions on attention, the present study aimed at exploring the potential of self-talk as a strategy to attenuate the effects of external distraction. In particular, we examined experimentally the effects of self-talk strategies on performance under conditions of auditory distractions in two different settings (lab and field). The lab experiment involved performance on a computer game requiring fine motor execution. The field experiment involved free-throwing in basketball. We

expected that in both settings under condition of distraction performance of the self-talk groups would be superior to that of the control groups.

Experiment 1: Lab

Method

Apparatus. An E-prime psychology software tool (E-prime 2.0) was used to develop an integrated environment aiming to present, control, and record the temporal parameters of the computer game. The visual stimuli were presented on a 19-in LCD computer monitor with screen dimensions of 1280x1024 pixels. Participants were responding on the presented stimuli via a joystick (Logitech Attack 3) that was placed in front of the computer monitor. In addition, a set of headphones was used for the final assessment when the external distraction was introduced.

Participants. Twenty-eight sport science students (17 males) were randomly assigned into two equal groups. The mean age of participants was 21.48 (± 1.58) years. Participants provided written informed consent before the onset of the study, and received course credit for their participation.

Performance task. A computer game was designed for the purposes of this study. Specifically, the game was designed in an E-prime environment and resembled the old "pong" game. In one side of the monitor there was a goal in the middle (15cm wide) and a paddle (5cm wide), and in the other side of the monitor there was a cannon throwing balls, which were all directed towards the goal. The width of the goal and the paddle were decided following pilot testing to produce an average between 50% and 60% so that participants would perceive the task as of moderate difficulty and challenging (not too easy to be boring, not too difficult to be disappointing). Participants were instructed to block the balls not allowing to go

through the goal. In order to block the balls participants should move the paddle horizontally (left/right) with the joystick.

Procedure and intervention. The institution's ethics committee provided permission to conduct the study. The experiment included three phases that were completed in one session: baseline assessment, short intervention, and final assessment. The total time of the session was approximately 50 minutes.

Phase 1: Baseline assessment. Initially, all participants received information about the requirements and the procedures of the experiment. They were also informed that the data would be confidential, and that they could withdraw from the experiment at any time. Subsequently, the baseline assessment took place in a controlled laboratory room. Participants were informed that they would be tested on a computer game named "pong". Participants had the opportunity to practice the game for one minute to become familiar with the concept of the game and the equipment. The frequency of the balls thrown from the cannon for the familiarization was one ball per second. After the familiarization, the baseline assessment took place. Participants were instructed to block as many balls as they could for a period of two minutes. The frequency of the balls thrown from the cannon for the baseline assessment was two balls per second. Each participant was tested individually.

Phase 2: Intervention programme. Following the completion of the baseline assessment the intervention phase took place. The intervention involved practicing a mini golf task that was introduced as an attention training fine task. The training lasted approximately 20 minutes, during which participants completed 4 sets of 15 hits (a total of 60 hits) attempting to putt the ball from a distance of 180cm from the hole. Participants of the control group received basic information about technical aspects of mini golf (e.g., body position, gripping of putter, swing). In addition they

received for approximately 5 minutes information regarding the history of the game and structure of a competition. The participants of the experimental group received the same information regarding mini golf instructions, and in addition they were introduced on the use of self-talk strategy. Specifically, they received information about self-talk as a performance enhancing strategy and instructions on how to use self-talk for the upcoming task; what to say (e.g., putt it), when to say it (e.g., just before the putt), and why to say (e.g., to ensure readiness and increase confidence). Participants were told that they could use the cue words either overtly or covertly. The self-talk for the golf training task included a variety of instructional (e.g., body still, eyes on target line) and motivational (e.g., ready, putt it) self-talk cues aiming on different aspects of performance (e.g., focus, confidence). In general, the intervention phase was designed for the participants to get acquainted with the use of self-talk (i.e., education and practice), but in a task different than the performance task, thus minimizing the learning effects on performance and isolate to the highest possible degree the self-talk effects. At the end of training session participants were asked to verbally report how frequently they were using the self-talk cues during the practice on a 10-point scale (1 = not at all, 10 = throughout the training).

Phase 3: Final assessment. Following the completion of the intervention phase, participants took place to the final assessment. Participants completed the same task as in the baseline assessment, only this time they were wearing headphones through which a sudden, non-continuous (10 seconds on, 5 seconds off), loud (approximately 95 dB) noise was introduced. This volume has been recommended as high enough to distract human attention and hamper performance, in contrast to lower volume whose impact has been questioned, but not to cause any harm (Smith, 1991). All participants were informed that they would perform the same computer game

under condition of external distraction in the form of a noise through the headphones, and were asked to block as many balls as possible despite the distraction. Participants of the experimental group were instructed in addition, to use a cue word (hit it) repeatedly to help them focus on the ball. The selection of the cue was decided following pilot testing where individuals were asked to select the most appropriate among a list or other relevant cues. After the completion of the final assessment, all participants completed a typical self-talk manipulation check protocol (Hardy, Hall, Gibbs, & Greenslade, 2005; Hatzigeorgiadis, Galanis et al., 2014) to ensure the integrity of the experimental conditions. In particular, participants in the experimental group were asked (a) to indicate the degree to which they used the instructed self-talk cues (from 1 = not at all, to 10 = all the time), (b) to report whether they consistently used any other self-talk cues, and if so (c) what these cues were, and (d) the degree to which they used these other cues (from 1 = not at all, to 10 = all the time). Participants in the control group were asked to indicate (a) whether they systematically used any form of self-talk during the task, and if so (b) what self-talk cues they used and (c) to what degree (from 1 = not at all, to 10 = all the time).

Results

Self-talk Manipulation Check. Participants of the experimental group reported very consistent use of self-talk during the self-talk short training sessions (M = 9.92, SD = 0.26) suggesting the intervention succeeded getting participants familiar with using self-talk. Similarly, for the final assessment participants of the experimental group reported, following the instructions, consistent use of self-talk during the task (M = 8.64, SD = 0.63); in addition, none of these participants reported using other self-talk in a consistent way. Regarding the control group, no participant reported

using self-talk in a strategic or consistent way; one participant reported self-talk 'move the bar' and one 'focus' but only occasionally (4 and 3 respectively on the 10-point scale).

Performance Task. One-way ANCOVA was conducted to test for differences between the experimental and the control groups on task performance, assessed as the percentage of blocked balls out of total, controlling for baseline performance. The analysis yielded a significant effect for baseline performance, $F(1, 27) = 6.76$, $p < .05$, partial $\eta 2 = .21$, and a significant group effect, $F(1, 27) = 4.52$, $p < .05$, partial $\eta 2 = .15$. Examination of the estimated mean scores showed that the self-talk group performed better ($M = 60.77$, $SE = .90$) than the control group ($M = 58.01$, $SE = .90$). The observed means for both groups in the baseline and final assessment are shown in Table 1.

Experiment 2: Field

Method

Participants. Female basketball players (mean age 20.96 ± 4.51; mean sport experience 9.21 ± 3.69 years) from two teams competing at the second division of the National Championship participated in this study. The teams were randomly assigned as either intervention ($n = 12$) or control ($n = 16$) groups. For the intervention group 11 players completed the intervention and one withdrew due to injury. No differences were found between participants of the two groups on age, $t(25) = 0.69$, $p = .49$, and sport experience, $t(25) = 0.31$, $p = .76$.

Procedure and intervention. The institution's ethics committee provided permission for the conduct of the study. Each team was contacted and a meeting was arranged with a member of the managing staff and the coach during which the

requirements of the research were explained. Upon agreement the dates of the intervention were decided. The study included three phases (baseline assessment, intervention, and final assessment) over a period of eight weeks, which were completed just prior to the play-offs of the season. Both team participated in the play-offs for promotion to the premier division.

Phase 1: Baseline assessment. All players received information about the requirements and the procedures of the experiment. They were also informed that the data would be confidential, and that they could withdraw from the experiment at any time. Participants then provided written informed consent for their participation in the study. Subsequently, the baseline assessment took place. Players were asked to perform 10 sets of free-throw pairs, as free-throws in games are most often performed in pairs. Each player was tested individually.

Phase 2: Intervention programme. In the first training session following the baseline assessment the intervention initiated. Players of both teams were explained how the free-throw training will be for the following six weeks. In particular, they were informed that for all sessions they will perform 8 sets of free-throw pairs after warming-up and prior to cooling-down. Three times per week a research assistant would attend the training. For the intervention group this session also included in addition a 20min presentation regarding self-talk strategies, where athletes were explained what self-talk is, how it benefits performance, and how the self-talk training will be introduced into their training. Thereafter, for three training sessions per week during the six following weeks, players of the intervention group were receiving just before the onset of the scheduled sets specific instructions about self-talk plans (what to say, when to say, why to say it). Upon completion of each free-throwing session

participants were asked to verbally report how frequently they were using the self-talk cues during the execution on a 10-point scale (1 = not at all, 10 = throughout the set). Overall, following the protocol of Hatzigeorgiadis, Galanis et al. (2014), the purpose of the intervention was to educate players on the use of self-talk, to get them training using self-talk consistently, and finally to enable them developing personal self-talk plans for free-throwing. During week 1 participants practiced using instructional self-talk cues (e.g., focus, rim); during week 2 they practiced using motivational self-talk cues (e.g., it's in, count it); during weeks 3 and 4 they practiced using combinations of instructional and motivational self-talk; finally during weeks 5 and 6 they developed their own free-throw self-talk plan for the final assessment. Following the last training of each week players were asked to reflect their experiences with the use of self-talk and were guided towards developing effective self-talk plans.

Phase 3: Final assessment. Following the completion of the intervention, the final assessment took place. Athletes, similarly to the baseline assessment were asked to perform ten sets of free-throw pairs. However, they were informed that this time the assessment would take place under conditions of external distraction in the form of a sudden, non-continuous (2-3 seconds on, 1-2 seconds off), loud noise (horn, approximately 95 dB). Players of the experimental group were instructed to use their personal self-talk plan they developed during the training program. After the completion of the final assessment, all participants completed a typical manipulation check protocol similar to that of the previous experiment.

Results

Manipulation check. Participants of the intervention group reported consistent use of self-talk during the training sessions across the intervention (M = 7.51, SD =

1.15), with a tendency to increase weekly except for week 5, suggesting that participant integrated successfully the self-talk strategy into their free-throwing (the mean scores for the six weeks were respectively: 6.63 ± 2.08; 7.51 ± 1.68; 7.90 ± 1.12; 8.26 ± 1.52; 7.71 ± 1.34; 8.39 ± 1.35). Similarly, for the final assessment participants of the intervention group reported consistent use of self-talk during free-throwing (M = 8.30, SD = 1.25); in addition, none of these participants reported using other self-talk in a consistent way. Examination of the players' self-talk plans showed that 60% of the cues had motivational content (e.g., it's in), whereas the remaining 40% had instructional content (e.g., focus). Regarding the control group, the manipulation check revealed that 3 participants made consistent use (scoring 8 or higher on the 10-pont scale) of self-talk (two participants reported the cue "it's in", and one the cue "get it in"). To protect the integrity of the experimental conditions these three participants were removed from the analysis.

Free-throwing performance. One-way ANCOVA was conducted to test for differences between the experimental and the control group on task performance, assessed as percentage of successful free-throws, controlling for baseline performance. The analysis yielded a significant effect for baseline performance, $F(1, 23) = 8.21$, $p < .01$, $\eta 2 = .28$, and a significant group effect, $F(1, 23) = 6.11$, $p < .05$, $\eta 2 = .23$. Examination of the estimated mean scored showed that the self-talk group performed better (M = 64.64, SE = 4.59) than the control group (M = 49.15, SE = 4.22). The observed means for both groups in the baseline and final assessment are presented in Table 2.[4]

[4] *The same analysis was conducted including participants from the control group who were excluded based on the manipulation check. The analysis yielded similar results, $F(1, 26) = 6.14$, $p < .05$, $\eta 2 = .20$; estimated mean scores showed that the self-talk group performed better (M = 63.84, SE = 4.41) than the control group (M = 49.55, SE = 3.64).*

Discussion

The present research examined the effectiveness of self-talk strategies under auditory distracting conditions. Two experiments were conducted, one in a lab environment and one in a field setting. Findings showed that, in both experiments, participants using self-talk performed better than control participants. There is a plethora of empirical evidence that self-talk strategies are effective in enhancing sport/task performance in a variety of settings, and this evidence has been well supported through systematic (Tod et al., 2011) and meta-analytic (Hatzigeorgiadis et al., 2011) reviews. Recently there has been a call for identifying and exploring the mechanisms underlying the facilitating effects of self-talk (Theodorakis, Hatzigeorgiadis, & Zourbanos, 2012); attention has been identified as a critical mechanism (Galanis et al., 2016; Hardy et al., 2009). In numerous studies the attentional effects have been postulated, in particular for tasks requiring precision and fine execution (Van Raalte et al., 1995), which place particular demands on attention functions. Distraction in the form of noise has been found to interrupt focused attention and harm performance in several settings (e.g., Coy et al., 2011; Dalton & Behm, 2007). In sport, despite the recognised harm distraction may produce on actual performance – evidenced in anecdotal reports and athletes' attributions of poor performance (Moran, 1996) – research is to date rather sparse.

The present findings suggest that using self-talk benefited performance under conditions of distraction in the form of sudden, loud, non-continuous noise. Two interrelated but seemingly different interpretations could be suggested for this effect. The first interpretation is that self-talk can help blocking, or deteriorating the intensity

of the distracting stimuli; i.e., participants not hearing the noise, or not noticing its intensity. Hatzigeorgiadis et al. (2004) reported in two experiments that the use of self-talk was linked to reduced cognitive interference, which has been described as a form of internal distraction (Moran, 1996). Even though the nature of internal distractions is different than that of external distractions, this finding align with the interpretation suggesting that self-talk can help blocking distractions. Considering a relevant study on external distractions, Jeon and colleagues (Jeon, Kim, Ali, & Choi, 2014) investigated the effects of a mental practice programme (imagery and relaxation) on task performance under distracting noise conditions in two badminton tasks. Participants were assigned into three groups: mental practice, mental practice with noise distraction, and control. The results showed for the closed-skill task participants of the mental practice group with noise performed better than the control group, whereas for the open-skill task participants of the mental practice group performed better than the control group. The authors suggested that mental practice may reinforce the main stimulus (i.e., task completion) while lessening the effect of external auditory stimuli.

The second interpretation for the beneficial effects of self-talk under distracting conditions is that self-talk helped enhancing the function of focused attention required when executing the tasks, thus minimizing the impact of distraction; that is, participants managed to maintain an effective focus despite experiencing the noise. Janelle et al. (1999), based on the principles of the limited capacity models of attention, argued that distraction reduces available attentional resources and constrains the processing of relevant cues. Thus, it may well be that self-talk can help preserving, or renewing attentional resources that benefit focused attention and subsequently performance. Attempting to test directly the effects of self-

talk on attention functions through behavioural measures, Galanis et al. (2017) reported that self-talk assisted performance in tests of focused attention. Furthermore, the findings of Gregersen et al. (2017), who reported that self-talk facilitated attentional performance under conditions of ego depletion, align with the interpretation that self-talk can enhance the quality of focused attention. Social validation data could have clarified some of the above postulations; however, this was not predicted in designing the study. Thus, future research could further examine whether such postulation can further explain the attentional effects of self-talk against distractions.

An interesting aspect of the results from the field experiment involves the participants' choice of cue words at the final assessment. As described in the methods, participants were trained to use different instructional and motivational cues for four weeks, while for the last two weeks they were asked to develop and practice their own plan for the final assessment. Most participants chose to include both instructional and motivational cues, but overall, 60% of the cues used were motivational and 40% instructional. The matching hypothesis stated by Theodorakis et al. (2012) suggested that, for tasks requiring accuracy and precision, instructional self-talk would be more effective; whereas, for tasks requiring strength and endurance, motivational self-talk should be more effective. Nevertheless, Hatzigeorgiadis, Zourbanos, Latinjak and Theodorakis (2014) argued, based on further empirical evidence (e.g., Hatzigeorgiadis, Galanis, et al., 2014; Zourbanos, Hatzigeorgiadis, Bardas, & Theodorakis, 2013), that two more matching hypotheses should be considered; one involving the setting by self-talk type matching and one involving the learning stage by self-talk type matching. Regarding the former, they argued that motivational self-talk seems more appropriate in competitive or evaluative settings, whereas

instructional self-talk seems more appropriate in training settings. Regarding the latter, they argued that instructional self-talk should be more effective for novel tasks, or tasks at the early stages of learning, whereas motivational self-talk should be more effective for well-learned tasks, or tasks at the automatic stage of performance.

Indeed, in a study with swimmers, where competitive performance was assessed following a similar intervention, participants developed competitive self-talk plans containing almost exclusively motivational self-talk (Hatzigeorgiadis, Galanis et al., 2014). Free-throwing in basketball is considered a task comprising fine features, thus according to the original matching hypothesis instructional self-talk should be more effective; however, participants were experienced players performing under evaluative conditions. Thus, according to the two latter matching hypotheses described above, the attributes of this situation would favour the use of motivational self-talk. Participants developed plans including both instructional and motivational elements, thus suggesting that personal characteristics, such as individual needs (Theodorakis et al., 2012) and cognitive processing preferences (Hardy et al., 2009), and the setting (environment) should be also considered when developing self-talk interventions (Hatzigeorgiadis, Zourbanos et al., 2014; Van Raalte et al., 2016).

In the present research several issues require consideration with regard to both study procedures and findings interpretation. First, we should notice that in the field study some control participants were excluded for using strategic self-talk in a systematic way. In the self-talk literature, the use of manipulation checks has been considered crucial to protect the integrity of the experimental conditions (Hardy, Hall, Gibbs, & Greenslade, 2005). In studies where detailed manipulation checks have been used, participants have been excluded for either reporting the use of strategic self-talk while in a control condition (Hatzigeorgiadis, Zourbanos, Goltsios, & Theodorakis,

2008), reporting not using self-talk while in an experimental condition (Hatzigeorgiadis, Zourbanos, Mpoumpaki, & Theodorakis, 2009), or reporting some other type of strategic self-talk, rather than the one instructed (Hardy, Begley, & Blanchfield, 2015). In accordance to this practice, control participants using self-talk systematically were excluded to prevent the integrity of the experimental manipulation.

Another methodological issue involves the distraction condition. The distraction introduced was in accordance with the relevant recommendations for creating distracting conditions (e.g., Smith, 1991); however, the degree to which the distracting stimuli were perceived by participants as such was not assessed. Such an assessment would serve as a manipulation check if adopted in both the baseline and the final assessments. In addition, it would be interesting for social validation reasons, as it may have shown that participants of the self-talk group perceived the stimuli as less distracting, thus providing a perceptual interpretation to the findings. Such an assessment would be recommended in future studies. Also, in relation to the distracting stimuli in the field experiment, the horn used to create the noise is a typical distraction that basketball players of such a competitive level face regularly within the sport culture of the country where the study took place. Nevertheless, this may not be the case in other countries or in other sporting disciplines; in future field studies researchers are therefore encouraged to adjust and create realistic distraction conditions such as the one used in our field study.

A final issue involves the training of self-talk itself in our lab study. There is robust meta-analytic evidence suggesting that training self-talk improves its effectiveness (Hatzigeorgiadis et al., 2011); therefore, we opted to include such training to our experimental design. Considering however that the experimental task

was novel and attempting to avoid learning effects, we choose to use another task for training self-talk (golf putting). The purpose of the training was to get participants familiar with the use of self-talk so that they would use it consistently in the final assessment. The training was based on an educational approach focusing on the function of self-talk strategies as instructions that initiates appropriate responses. Participants were trained on 'what', 'when', and 'why' the cue words were used, a rational that was also presented for the experimental task. Despite the discrepancy between that training task and the final assessment task, participants of the self-talk group reported consistent use of self-talk, thus supporting the effectiveness of the self-talk training. The training of self-talk was not an issue for the filed study where experienced athletes were tested on a well learned task, where learning effects were not possible, thus allowing the training to be implemented on the experimental task. Researchers are encouraged to use task-relevant training to practice self-talk when the possibilities of task learning effects are minimal.

One of the strengths of the present investigation is the testing of the hypothesis both in lab and field settings. The lab provides a suitable environment for basic research hypothesis testing, however the external validity of findings cannot be supported with confidence. In contrast, field experiments provide a setting where, despite relative losses in control over experimental conditions, the ecological validity can be confidently supported. The results of the two studies combined provide strong evidence that self-talk can help countering the effects of external distractions on performance. Considering that distractions have detrimental effects on focused attention, the findings suggest that self-talk can be an effective strategy to enhance the quality of attention functions. Coaches are encouraged to work with players susceptible to distraction through the development of self-talk plans, considering the

sources of distraction and athletes' individual characteristics and preferences, to help defy the effect of the distractions. Finally, the findings provide indication that the attentional effects of self-talk may be a viable mechanism explaining the facilitating effects of self-talk on sport performance. Thus, future research could use research designs that allow testing this mediation to help developing robust hypotheses for self-talk mechanisms and a comprehensive self-talk theory.

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Table 1.

Lab experiment: Descriptive statistics for percentage of blocked balls for the two groups.

	Baseline		Final	
	M	*SD*	*M*	*SD*
Experimental	57,88	3,93	60,29	3,71
Control	59,82	2,82	58,48	3,58

Table 2.

Field experiment: Descriptive statistics for percentage of successful free-throws for the two groups.

	Baseline		Final	
	M	*SD*	*M*	*SD*
Experimental	60,00	14,49	65,90	18,81
Control	56,53	12,97	48,07	16,27

CHAPTER 5: GENERAL DISCUSSION

In the sport self-talk literature, the exploration of possible mechanisms is a priority field of inquiry. Identifying the mechanisms underlying the effectiveness of self-talk will allow us to develop a sound self-talk theory and design and implement more effective self-talk interventions. The main purpose of this dissertation was to investigate potential mechanisms that explain the facilitating effects of self-talk on performance. So far, preliminary evidence regarding self-talk mechanisms has mostly focused on exploration of possible self-talk mechanisms through (a) self-report, including testimonials from athletes participating in experiments testing the effectivenees of self-talk for performance enhancement and qualitative inquiries and case studies and (b) postulations based on the results of experiemtns testing the effectiveness of self-talk interventions on task with different motor and cognitive demands. This evidence has been reviewed in a systematic way in the first study of this dissertation, which provides a working model for the exploration of self-talk mechanisms. Following the development of this model, two empirical studies were conducted focusing on attentional mechanisms of self-talk; one exploring the effects of self-talk on attention functions through behavioural measures of attention, and one exploring the effects of self-talk on task performance under contextually challenged attention conditions. In this final chapter, first, the findings of the conducted studies are presented and discussed. Next, based on the overall findings, practical implications are suggested. Finally, limitations of the studies are identified and directions for future research are provided to help building upon the present findings.

Overview and discussion of the findings

Chapter 2 described a systematic review of the existing literature relevant to the identification of the self-talk mechanisms and provided a prospective model of self-talk mechanisms, based on theoretical frameworks, which have been developed for the understanding of the mechanisms, and the relevant literature. The scant research on the mechanisms underlying the effectiveness of self-talk has mostly focused on two wider clusters of mechanisms: attentional and motivational. The first cluster relates to an attentional interpretation of the facilitating effects of self-talk, comprising the different dimensions of attention, and including attentional constructs and theoretical perspectives (e.g., cognitive behavior therapy, rational emotive therapy) that can be linked to the study of self-talk mechanisms: width and direction of attention, distractibility, and mental effort. The second cluster relates to a motivational interpretation of the facilitating effects of self-talk, comprising cognitive, affective, and behavioral aspects of motivation, and including constructs and theoretical perspectives (e.g., social cognitive theory, self-regulation learning) that can be linked to the study of self-talk mechanisms: self-efficacy, self-confidence and anxiety, and effort and persistence. Overall, the approaches and the evidence reviewed in this chapter provide challenging research perspectives for the understanding of self-talk mechanisms and the self-talk phenomenon in total. Finally, the model proposed in this chapter is intended as a dynamic platform for the development of systematic research on self-talk mechanisms.

Chapter 3 examined the effects of a self-talk intervention on the different attention functions, as these described by Sturm (2005), through objective behavioral measures of attention. Six experiments were conducted to investigate the impact of self-talk on alertness, vigilance, selective, focused, divided, and spatial attention using

a between subject experimental design. The Test Battery for Perception and Attention Functions (WAF tests) from the Vienna Test System was used to examine objectively the attentional performance. Overall, the results provided consistent support for the positive effects of self-talk on attention functions. The experimental groups produced consistently faster reaction times in all dimensions of attention, and a meta-analytic synthesis of the results showed a large effect size in accordance with the results from the meta-analytic study by Hatzigeorgiadis, Zourbanos, Galanis, and Theodorakis (2011) who reported large effect sizes for fine tasks, for novel tasks, and for studies where participants had received training on the use of self-talk. This robust evidence reinforces previous findings regarding the attentional effects of self-talk through objective behavioral measures recognizing attentional functions as an important element of task performance. Furthermore, this evidence through the direct measures of attentional performance attests for aninformation processing self-talk perspective. Considering Wrisberg's (1993) proposition regarding the perceptual processing, decision processing, and effector processing, the results suggest in particular an effector processing interpretation, linked to the initiating movement sequences. Accordingly, it can be concluded that self-talk strategies can be used as cues triggering or directing attention thus enhancing attentional performance. Finally, the study has connotations to Ong's (2015) remarks regarding the overreliance of sport psychology research on self-report measures and Baumaister, Vohs, and Funder's (2007) suggestion for the need to forward assessment of inner processes that mediate actions through overt behavioural responses as indicators of mental phenomena. In particular, the study support that the VTS could help forwarding research investigating cognitive processes in relation to self-talk, in particular with regard to an

information processing approach and encourages further research towards this direction.

An important for the field of sport approach to the study of attention, which may be linked to the study of self-talk mechanisms, is the distraction approach (Moran, 1996). Chapter 4 examined the potential of self-talk as a strategy to attenuate the effects of external distraction and in particular, the effects of self-talk strategies on performance under conditions of auditory distractions. Two experiments were conducted, one in a laboratory context and one in a field context. Overall, the results showed that in both experiments participants using self-talk performed better than control participants. Based on the findings, two interpretations can be forwarded: (a) that self-talk can help blocking, or deteriorating the intensity of the distracting stimuli, and (b) self-talk can help enhancing the function of focused attention required when executing the tasks, thus minimizing the impact of distraction. Janelle, Singer, and Williams (1999), based on the principles of the limited capacity models of attention, argued that distraction reduces available attentional resources and constrains the processing of relevant cues. Thus, it may well be that self-talk can help preserving, or renewing attentional resources that benefit focused attention and subsequently performance. Taking into consideration that distractions can hurt focused attention, these findings suggest that self-talk can be an effective strategy to enhance the quality of attention functions, providing indication that the attentional effects of self-talk may be a viable mechanism explaining the facilitating effects of self-talk on sport performance.

Overall, the findings of the present dissertation provide important evidence for the beneficial effects of self-talk strategies on attention and indicate attention as a critical mechanism that potentially mediates the effects of self-talk strategies on

performance. In summary the results suggest that self-talk strategies can help to (a) alert and maintain alertness to different forms of stimli, (b) trigger, and direct attention to appropriate stimuli, and (c) increase or maintain attentional capacity and reduce loses in attentional capacity under attentinally challenging conditions.

Considering the strengths of this investigation, these would include (a) the methodological rigour of experimental research to establish causal relatinships, (b) the objective behavioural measures of attention used to establish the attentional effects of self-talk, (c) the multiple measures that were employed in all the experiments and the replicability of the findings which strengthens our confidence in the identified effects, and (d) the transfer of the findings from the lab to the field that attest for the ecological validity of the findings.

Limitations

Notwithstanding the strengths, there are certain issues that require consideration. First, for the lab experiments, a basic research approach was adopted to explore the effect of self-talk on attention functions. Within this framework the lack of direct relevance of the experimental measures with sport should be noticed, as the measures that were used involved non-sport tasks, but rather attention skills integrally related with sport. The choice for this type of research methods and measures limits the external validity of the findings; however, the use of objective behavioural measures in controlled laboratory environment, in combination with the consistent replicability of the results, provides strong indications regarding the attentional effects of self-talk.

Second, the exlusion of participatns following self-talk manipulation checks should be addressed. Excluding participants may present a threat to the experimental

design as the a priori specified groups were not maintained, however, this was intended to protect the integrity of the experimental conditions. Participants were excluded from the control group if reporting strategic use of self-talk, and from the experimental group if reporting inadequate use of self-talk following the experimental instructions. In the literature, even though participants from control/experimental groups have been removed from analyses for using/not using self-talk in a systematic way (e.g., Hardy, Begley, & Blanchfield, 2015; Hatzigeorgiadis, Zourbanos, Mpoumpaki, & Theodorakis, 2009), there is no standard criterion for such a decision. Gregersen, Hatzigeorgiadis, Galanis, Comoutos, and Papaioannou (2017), revisited previous studies to track participants' mean scores of using self-talk in effective interventions, where self-talk training has been applied. Subsequently, they used these data to suggest guidelines regarding cut-off points for the use of self-talk. These criteria were used in the present investigation and are recommended for future interventions as a guideline for screening participants in self-talk intervention studies. Interestingly, however, experimental particpants using self-talk after receiving relevant training pefromed better that control participants using self-talk. Therefore, in accordance to the results from Hatzigeorgiadis et al. (2011) meta-analysis, the effect can be attributed to the self-talk training effect rather than the use of self-talk onsite.

Finally, with regard to the experimental design of the experiments, it should be stressed that the present studies provide evidence only for the effects of self-talk on attention functions. This evidence provides valuable ground for the hypothesized mediational role of attention in the relationship between self-talk strategies and performance, however, these mediation effects were not tested in the present investigation. Research adopting designs appropriate for testing mediation effects should be adopted to directly test the hypothesized mediation.

Implication for practice

Hatzigeorgiadis, Zourbanos, Latinjak, and Theodorakis (2014) in developing the IMPACT, a guide for the development of effective self-talk interventions identified the importance of considering personal, task, and contextual factors. Understanding the mechanisms will help to develop effective interventions considering such factors. The results of the present investigation can provide some important implications towards the development of effective interventions. First, with regard to personal factors and individual needs, the findings suggest that self-talk can help develop attention functions. Identifying deficits in attention functions can help developing training programs aiming at improving attention functions. The integration of appropriate self-talk strategies in such programs will help maximizing their effectiveness and improve attentional performance. Second, self-talk strategies can help coping with distractibility issues many athletes face. Training under distracting conditions using self-talk can eventually help athletes overcoming distractibility problems and enhance performance effectiveness. With regard to task characteristics, coaches and sport psychologist would need to identify the attention functions that are mostly relevant to sport and develop training drills involving such functions. Subsequently, training these drills using appropriate self-talk strategies would help enhancing performance related to these attention dependent sport tasks. Finally, with regard to contextual factors, coaches and sport psychologists could identify potential distractors from the sport and the competitive environment and train using simulated conditions. Developing self-talk strategies and training under such contextually challenging conditions could eventually help maximizing competitive performance.

Future research directions

The prospective model of self-talk mechanisms and the current findings provide valuable evidence that can guide further developments for the investigation of self-talk mechanisms. Extending this line of research could involve testing further the attentional perspcetives, extending research to other potential mechanisms identified in the model, and adopting interdisciplinary methods, with emphasis on psychophysiology, to provide a more holistic understanding of the self-talk phenomenon. In relation to the present investigation, future research could employ field experiments and make use of sport specific tasks to support the ecologicl validity of the current findings regarding attention functions. Furthermore, such future field experiments could identify realistic distraction conditions depending on the characteristics of particular sport to test the effectiveness of self-talk strategies in a variety of sport tasks and performance.

With regard to advances in the self-talk mechanisms in sport in general, exploring motivational perspectives is another direction with important implications. From the early years of self-talk, the instructional and the motivational functions of self-talk have been widely recognized. The currect research explored attentional perspectives reflecting mostly the instructional functions of self-talk. Future research can provide new insights into the motivational aspects identified in the prospective model of self-talk mechanisms, through the exploration of cognitive, emotional, and behavioural variables.

Finally, an exciting prospect with regard to the exploration of self-talk mechsnisms involves mutl- and cross-disciplinary approaches. Combining physiological and psychological measures will help relating respective changes and link the psychological and behavioural outcomes of self-talk with physiological

outcomes. Furthermore, the adoption of psychophysiological measures will greatly facilitate our understanding. Towarsd this direction, the assessment of varibales such as heart rate variability, gaze behavior and eye fixations, electroencephalography, and functional magnetic resonance imaging will greatly enhance our understanding and expand the field.

Conclusions

Self-talk research in sport has attracted significant research attention due to its significant and direct applied focus. The links between congition and behavior, thought and action, and the imporgtance of performance within sport, have led sport psychologist to the development of strategies aiming to influence performance through the regulation of self-talk. In the sport literature self-talk interventions have proved effective for enhancing performance; yet it has been recognized that self-talk may serve different functions, through the activation of different mechanisms. The study of the mechanisms underlying the effectiveness of self-talk for enhancing sport performance is an exciting research endeavor. Understanding the mechanisms will help to build a comprehensive self-talk theory and to develop effective interventions. The present thesis provided an overview of self-talk mechanism literature and subsequently focused on the investigation of attentional perspective. The empirical findigns support that self-talk strategies have important effects on attentional performance; first, self-talk strategies can help improving the attention functions, second, self-talk strategies can help countering the aversive effects of external distractions on task performance. It is my hope that will this work will open new avenues for further investigating self-talk mechanisms and the understanding of the self-talk phenomenon in sport.

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Appendix: General I

Ethics committee approval (D.P.E.S.S., University of Thessaly)

ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ
ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ ΦΥΣΙΚΗΣ ΑΓΩΓΗΣ ΚΑΙ ΑΘΛΗΤΙΣΜΟΥ

Εσωτερική Επιτροπή Δεοντολογίας

Τρίκαλα: 13/3/2013
Αριθμ. Πρωτ.: 696

Αίτηση Εξέτασης της πρότασης για διεξαγωγή Έρευνας με τίτλο:
Μηχανισμοί λειτουργίας της αυτο-ομιλίας

Επιστημονικώς υπεύθυνος / επιβλέπων: κ. Χατζηγεωργιάδης Αντώνης
Ιδιότητα: Επίκουρος Καθηγητής
Ίδρυμα: Πανεπιστήμιο Θεσσαλίας
Τμήμα: Επιστήμης Φυσικής Αγωγής και Αθλητισμού

Κύριος ερευνητής / φοιτητής: κ. Γαλάνης Ευάγγελος
Πρόγραμμα Σπουδών: Διδακτορικό
Ίδρυμα: Πανεπιστήμιο Θεσσαλίας
Τμήμα: Επιστήμης Φυσικής Αγωγής και Αθλητισμού

Η προτεινόμενη έρευνα θα είναι:

Διδακτορική διατριβή □√

Τηλ. επικοινωνίας: 2431047023 - 6940805961
Email επικοινωνίας: v.galanis@hotmail.com

Η Εσωτερική Επιτροπή Δεοντολογίας του Τ.Ε.Φ.Α.Α., Πανεπιστημίου Θεσσαλίας μετά την υπ. Αριθμ. 3-2/13-2-2013 συνεδρίασή της εγκρίνει τη διεξαγωγή της προτεινόμενης έρευνας.

Ο Πρόεδρος της
Εσωτερικής Επιτροπής
Δεοντολογίας – ΤΕΦΑΑ

Τσιόκανος Αθανάσιος
Αναπληρωτής Καθηγητής

Appendix: General II

Questionnaires

Control groups (final assessment)

Date of birth:			
Sex:	Male □		Female □
Nationality:			
Do you do any sport:	Yes □	No □	Was □
What kind of sport:	Individual □		Team □
What sport exactly:			

1. Did you use any specific strategy to improve your performance?

   YES [ ] NO [ ]

2. If yes, **what was your** strategy;
   ……
   ……

3. If yes, **how** often did you use it/them?

Not at all									**All the time**
1	2	3	4	5	6	7	8	9	10

1. Is there something **specific** that you were saying to yourself during the test?

   YES [ ] NO [ ]

2. If yes, **what** exactly you were saying?
   ……
   ……

3. If yes, **how** often you were saying that;

Not at all									**All the time**
1	2	3	4	5	6	7	8	9	10

1. How much effort did you overcome during the test?
(note it with a "X" at the point that represents your effort)

Low	Medium	High
0	75	150
. . . . .		

During the test I had thoughts such as. . .	not at all				very much
. . . I am not performing well	1	2	3	4	5
. . . I do not want to take part in this test any more	1	2	3	4	5
. . . I am not going to achieve a good score	1	2	3	4	5
. . . I want to get out of here	1	2	3	4	5
. . . other are better than me	1	2	3	4	5
. . . I want to stop	1	2	3	4	5
. . . my performance is very poor	1	2	3	4	5
. . . I cannot take it any more	1	2	3	4	5
. . . I am tired	1	2	3	4	5
. . . other will be disappointed by my performance	1	2	3	4	5
. . . I want to quit	1	2	3	4	5
. . . I am not good at that	1	2	3	4	5

Name: ……

Thank you very much for your participation.

Experimental groups (final assessment)

Date of birth:			
Sex:	Male □		Female □
Nationality:			
Do you do any sport:	Yes □	No □	Was □
What kind of sport:	Individual □		Team □
What sport exactly:			

1. Did you use the "key words" that we suggested for the test?

YES [ ] NO [ ]

2. If yes, **how** you used them?

Not at all									**All the time**
1	2	3	4	5	6	7	8	9	10

Using self-talk made / helped me . . .	not at all				very much
. . . feel more certain for myself	1	2	3	4	5
. . . execute impulsively	1	2	3	4	5
. . . maintain effort high levels	1	2	3	4	5
. . . feel more relaxed	1	2	3	4	5
. . . concentrate on what I'm doing at the moment	1	2	3	4	5
. . . feel more confident for my abilities	1	2	3	4	5
. . . execute automatically	1	2	3	4	5
. . . keep trying my best	1	2	3	4	5
. . . reduce my nervousness	1	2	3	4	5
. . . concentrate better to the execution	1	2	3	4	5
. . . feel stronger	1	2	3	4	5
. . . execute as if on an automatic pilot	1	2	3	4	5
. . . make my effort more intense	1	2	3	4	5
. . . let go my anxiety	1	2	3	4	5
. . . direct my attention efficiently	1	2	3	4	5
. . . boost my confidence	1	2	3	4	5
. . . execute spontaneously	1	2	3	4	5
. . . try harder	1	2	3	4	5
. . . interrupt negative thoughts	1	2	3	4	5
. . . stay focused	1	2	3	4	5
. . . psych-up myself	1	2	3	4	5
. . . perform as on automatic pilot	1	2	3	4	5
. . . increase effort	1	2	3	4	5

. . . stay calm	1	2	3	4	5
. . . concentrate on what I have to do	1	2	3	4	5

3. Apart from the "key words" that we suggested for the test, were you saying **something specific** to yourself during the test?

   YES [ ] NO [ ]

4. If yes, **what** exactly?

   ……

5. If yes, **how** often?

Not at all									**All the time**
1	2	3	4	5	6	7	8	9	10

6. How much effort did you put during the test?
   (note it with a "X" at the point that represents your effort)

Low	**Medium**	**High**
0	75	150
. . . . .		

During the test I had thoughts such as. . .	not at all				very much
. . . I am not performing well	1	2	3	4	5
. . . I do not want to take part in this test any more	1	2	3	4	5
. . . I am not going to achieve a good score	1	2	3	4	5
. . . I want to get out of here	1	2	3	4	5
. . . other are better than me	1	2	3	4	5
. . . I want to stop	1	2	3	4	5
. . . my performance is very poor	1	2	3	4	5
. . . I cannot take it any more	1	2	3	4	5
. . . I am tired	1	2	3	4	5
. . . other will be disappointed by my performance	1	2	3	4	5
. . . I want to quit	1	2	3	4	5
. . . I am not good at that	1	2	3	4	5

Name: ……

Thank you very much for your participation.

Experimental groups (manipulation check in training sessions)

Using a scale from 1 to 10, where 1 means not at all and 10 means all the time, tell me during the training how much you used the keywords that we agreed.									
Not at all									**All the time**
1	2	3	4	5	6	7	8	9	10