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The Effect of a Mindfulness Intervention on Spontaneous Self-Talk and Performance in

Greek Female Football Players

By

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The author of this thesis received substantial help from Dr. Antonis Hatzigeorgiadis and Iliana Kapsokoli in the completion of this research project.

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Name & signature of the author

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ABSTRACT

Research into mindfulness-based interventions (MBIs) in sport have provided some evidence in support of a positive relationship between mindfulness and performance, though the manner in which mindfulness affects performance is still unclear. One potential way in which mindfulness affects performance may be through the potential relationship between mindfulness and spontaneous self-talk. As such, this study examines the extent to which mindfulness influences both sport performance and spontaneous self-talk, as well as the nature of the relationship between mindfulness, sport performance, and spontaneous self-talk. Two women's football (soccer) teams in Greece participated in a nine-week long experiment that occurred during the competitive season. In the first and last weeks of the experiment, participants on both teams rated their current levels of mindfulness and spontaneous self-talk, and were assessed on their shooting accuracy. For the interceding seven weeks, one team participated in the Mindfulness Meditation Training for Sport 2.0 intervention alongside of their normal training schedule, while the other team simply continued with their normal training schedule. Analysis of pre-intervention data indicated that both prospective and retrospective positive self-talk were moderately correlated with overall levels of mindfulness as well as the mindfulness factor of refocussing. Further analyses indicated that there were no significant changes over time, no significant differences between groups, and no significant interaction between experimental condition and time for each of the three factors. No significant correlations were found between the amount of change for mindfulness, self-talk or sport performance. Mediation analysis indicated that spontaneous self-talk did not significantly mediate the relationship between mindfulness and sport performance. The significance of these findings in relation to prior research is discussed.

Keywords: mindfulness, sport performance, MMTS, spontaneous self-talk, soccer.

The Effect of a Mindfulness Intervention on Spontaneous Self-Talk and Performance in Female

Football Players

Over the past few decades a movement has risen within the field of psychology, centering

on challenging the historical idea that in order to enhance psychological functioning in an

individual, a psychologist must help them to challenge their internal experiences with the goal of

learning to control or reduce the impacts (Gardner & Moore, 2012). From this movement, the

idea has emerged that instead of trying to control our internal experiences, psychotherapy should

seek to help people to modify their relationship to their experiences (Gardner & Moore, 2012).

Central to this movement has been the concept of *mindfulness,* which concerns itself with the

ability to be both aware and accepting of the experience of the present moment (Baltzell &

Akhtar, 2014). In turn, this practice aims to help athletes develop enhanced mental efficiency,

enabling them to choose what they pay attention to in the moment, allowing for increased focus

on the task in front of them (Baltzell et al., 2014). However, while research has indicated that

mindfulness training is generally beneficial to a variety of different physical and psychological

aspects of performance in athletes, several questions still surround the exact nature of this

relationship (Bühlmayer et al., 2017; Gardner & Moore, 2017). As such, this study sets out to

provide more information about these relationships, by examining how participation in a

mindfulness-based intervention influences both spontaneous self-talk and performance in

athletes.

In their paper looking at current trends and innovations in cognitive and behavioral

therapies, Hayes (2004) identified several key trends in research that appeared to indicate the

beginnings of a third wave of treatments. Hayes defined the first wave of cognitive behavioral

treatments as those stemming from the era of neo-behaviorism in the 1960s, with therapies

focussing directly on conditioning and other similar principles, focussing almost exclusively on problematic behaviors without looking for underlying reasons why the behavior was occurring. The second wave then arose in the late 1960s, as the limitations of pure stimulus – response treatments started to become apparent, and behavior therapists began to recognize that they needed to take a more central approach to dealing with thoughts and feelings alongside behavior (Hayes, 2004). This lead to the rise of cognitive-behavioral therapy (CBT), which saw the development of new treatment methods aimed at correcting – through weakening or elimination – irrational thoughts and problematic methods of processing information, through a variety of fairly rigid and structured techniques. Over the years however, this second wave of thought has become weakened, both through systematic anomalies (e.g. Bieling & Kuyken, 2003; Burns & Spangler, 2001; Gortner et al., 1998; Ilardi & Craighead, 1994), as well as a shift in the overall scientific philosophy in psychology from a largely mechanistic approach to one that is more contextual in nature (Bouton et al., 2001; Hayes, 2004).

As a result of these identified issues in the second wave, Hayes (2004) argued that a third wave of CBT treatments had been or were in the beginning stages of development, characterized by several distinctive facets. The third wave of CBT included a greater sense of openness to older clinical traditions, focussing on second-order and contextual symptoms and changes, as well as the development of repertoires consisting of different flexible and effective techniques emphasising a focus on whether or not the technique functioned over the mechanistic form it contained (Hayes, 2004). These new theories have emphasized a variety of issues (Hayes & Hofmann, 2017), with one of the key differences to previous CBT approaches was the focus on the process of the thought instead of the content of the thought, with the goal of helping individuals become aware of their thoughts without judgement (Hetrick et al., 2016; Hofmann,

Sawyer, & Fang, 2010). While several different therapies have been developed, they all encourage mindfulness of one's internal and external experiences and emphasize acceptance over change (Brown et al., 2011). This current study touches on the usage of several of these new therapies in the sporting context, with the overall concept of mindfulness as a central focus throughout.

Mindfulness has been defined in many different ways over the years, across many different psychological and theological practices (Mace, 2007). This concept is further complicated in that although mindfulness and *mindful awareness* are often equated, mindfulness actually consists of both mindful awareness (the outcome), as well as a mindful practice (the process) (Shapiro, 2009). Because of this complexity, it is important to first define each of these individual aspects, as well as the encompassing concept of mindfulness, in order to begin to provide context for the research on this topic. As such, mindful awareness can be defined as "an abiding presence or awareness, a deep knowing that manifests as freedom of mind (e.g. freedom from reflexive conditioning and delusion)" (Shapiro, 2009, p. 556). Shapiro (2009) further defines the mindful practice as "the systematic practice of intentionally attending in an open, caring, and discerning way, which involves both knowing and shaping the mind" (p. 556). Taken together then, mindfulness can be seen as a way of being, of inhabiting one's body, mind, and moment-to-moment experiences that allows the individual to not only know and experience each passing moment, but also to receive each experience in an open and receptive manner (Shapiro & Carlson, 2009).

The History of Mindfulness

Though the majority of this paper will focus on contemporary applications of mindfulness and mindfulness meditation, it is important to first discuss the historical origins of

mindfulness practices in order to contextualize the more contemporary approaches (Kang & Whittingham, 2010; Wallace, 2007). Though mindfulness has only come into the awareness of the world of psychotherapy in the past 40 years, since the introduction of mindfulness-based stress reduction (Kabat-Zinn, 2011), its origins lie within Buddhist teachings stretching back nearly 2500 years (Mace, 2007). This is important to keep in mind, as the conceptualization of mindfulness that has been developed within psychology is much more limited in scope than the concept of mindfulness within Buddhism (Kang & Whittingham, 2010). Indeed, the concept of mindfulness is so central to Buddhism that of the 37 listed requisites for enlightenment in the tradition, mindfulness is listed eight times (Murphy, 2016). Therefore, in order to understand both the strengths and weaknesses of contemporary practices, one must first outline this broader scope of mindfulness.

Over the past 2500 years many different traditions of Buddhism have been developed (Mace, 2007), some of which have adopted meta-physical elements that have lead to the tradition treating the Buddha as a deity (McWilliams, 2014a). Yet, when looking at the essential teachings that appear across all of these different traditions, Buddhism can be better understood as a way of living that focuses on our own direct and observable personal experiences, teaching that the path to enlightenment or awakening is through one's own effort (McWilliams, 2014a). Through this lens, Buddhism embraces a path and a set of teachings that aims to help eliminate our attachments to aspects of our worldview such as our obsessions or viewpoints, with the foundational belief that increased awareness of these attachments enables us to understand and consequently break the chain of interdependent causation (McWilliams, 2014b). In order to do this, one must learn to gain mindful awareness of the impermanent nature of the phenomena that

appears in our daily lives, which in turns allows us to gain a comfortable life of stability as well as peace of mind (McWilliams, 2014b).

The practical nature and application of this mindful awareness of mindfulness is found in several different traditional teachings. One of these is referred to as the *Mathasatipatthana Sutta* (Mace, 2007), in which the four foundations of mindfulness are outlined. The four foundations in this Sutta are the contemplation (*anupassana)* of the body, of feelings, of the mind, and the objects of the mind, or the awareness of and attention to the phenomena, experiences and thought processes that arise and cease within the mind (Murphy, 2016). In addition to this, right mindfulness (*samma sati*), is also featured as the seventh factor in an integrated path of training abilities in intellectual, ethical, meditative and wisdom domains (Kang & Whittingham, 2010). In this context, ethical judgements are integrated into this process, combining with a sense of wisdom to gain an understanding of the entire experiential process, including the underlying causes and conditions, as well as the effects and implications of a given action or thought (Kang & Whittingham, 2010). In the lens of Buddhism, this in turn helps the individual to develop a sense of wisdom, in which they become aware of the thoughts, emotions, and actions they should abandon or nurture based on the extent to which each experience will affect their ability to achieve their goal of enlightenment (Kang & Whittingham, 2010). Thus, mind training to develop this state of mindfulness necessarily became a central aspect of many of the Buddhist traditions (Mace, 2007).

In order to develop this mindfulness, the Buddha describes the starting point as developing a sense of confidence in the path itself, which, in turn, is accompanied by a sense of general mindfulness and attentiveness to everyday tasks (Kang & Whittingham, 2010). The logical extension of this description is that if one does not have confidence in the idea of

mindfulness being beneficial to themselves, it will be substantially harder for them to develop mindfulness. Buddhist teachings further elucidate that mindfulness can be developed through the use of meditation, as most Buddhist meditations help to calm the mind and enable the individual to better see and understand what is inside their mind, and how their thoughts and actions have come to exist (Chan, 2008). For instance, the Pali Canon explicitly describes the contemplation of the breath (Nanamoli & Bodhi, 2005), with the goal of learning to understand the experience of each breath without judgement, becoming more aware of their thoughts and actions at the same time. Similarly, the aforementioned four foundations of mindfulness include the contemplation of the body, a meditation technique to increase the individual awareness of both their internal and external physical experience, without judgement (Mace, 2007; Murphy, 2016). These meditational practices have become some of the main focusses of integrating mindfulness into western scientific practices.

Modern scientific practices aim to incorporate these techniques and teachings into contemporary therapies, working to help individuals with physical and mental issues such as stress or anxiety (Murphy, 2016). What is generally seen to be the first adaption of these traditional Buddhist teaching on mindfulness into western practices, was done by Jon Kabat-Zinn at the Stress Reduction Clinic within the University of Massachusetts Medical School (Birrer et al., 2012; Ellis, 2006; Kabat-Zinn, 2011). This clinic was developed in response to a meeting Kabat-Zinn had with several of the directors of the primary care, pain and orthopedic clinics in the hospital who indicated that they were only able to help as few as 1 in 10 of their patients (Kabat-Zinn, 2011). As such, an 8 week course was developed in which the patient is invited to participate in their own health and well-being, through a focus on the present moment, helping the patients learn to put their energies in the things that are going well within them, and which

they can control, and helping them let go of and put the management of their issues into the hands of the hospital staff (Kabat-Zinn, 2000; Kabat-Zinn, 2011). While the teachings in this program were taken directly from Kabat-Zinn's personal experience with traditional Buddhist practices, across several schools of Buddhism, the program was created with an eye toward the development of a western vocabulary around the practices. This was done in order to increase the palatability of mindfulness practices to the wider western population, so that the traditional practices would become more understood and accepted (Kabat-Zinn, 2011).

In addition to an increase in acceptance of mindfulness within the general population, this focus on and creation of a western vocabulary also led to increased interest in researching the potential benefits and effectiveness of using mindfulness as a therapeutic technique (Grossman et al., 2010; Gu et al., 2015). As Kabat-Zinn's program, referred to as mindfulness-based stress reduction (MBSR), was initially developed in a hospital setting, much of the resulting interest has been centered around examining its effect on general health outcomes relevant to issues commonly treated in more medical facilities (Hofmann, Sawyer, Witt, et al., 2010; Niazi & Niazi, 2011; Sharma & Rush, 2014). For instance, research has shown some benefits of the MBSR program in helping individuals cope with, and in several cases, achieve and maintain positive outcomes on problems ranging from chronic pain (Kabat-Zinn et al., 1987) to cancer (Smith et al., 2005), and from type 2 diabetes (Rosenzweig et al., 2007) to psoriasis (Kabat-Zinn et al., 1998). Although, these studies mainly examined physiological problems, a body of literature has also been developed that has examined the use of MBSR programs on both clinical and non-clinical psychological illnesses.

Several meta-analyses and systematic reviews provide evidence into the efficacy of MBSR in the treatment of psychological problems. For instance, Bohlmeijer et al. (2010)

performed a meta-analysis of eight randomized controlled (RCT) studies in order to investigate the effects of the MBSR program on depression, anxiety, and general psychological distress. They found that across the eight studies, there was a small effect of MBSR on depression and psychological distress, and a moderate effect on anxiety (Bohlmeijer et al., 2010). These results were supported by a systematic review which found evidence of significant decreases from MBSR programs in comparison to controls in depression, anxiety, stress, and mood disturbance across a variety of populations with chronic diseases (Niazi & Niazi, 2011). However, although this meta-analysis provides some evidence as to the efficacy of MBSR in treating psychological issues, the overall conclusions that can be drawn are limited in that it was focussed only on individuals with chronic somatic diseases, and as such some generalizability issues may exist when extending the results to the general population.

This limitation has been addressed in several other meta-analytical studies which examined the effects of MBSR across a wider population. One such meta-analysis, conducted by Grossman et al. (2010) who looked at 20 separate studies across a wide variety of populations including clinical populations of individuals with both somatic and psychological illnesses, as well as stressed nonclinical populations. They found that there was a significant medium strength effect of mindfulness meditation across a spectrum of mental health measures, including depression, anxiety, and quality of life (among others). Furthermore, this effect was seen in their study, regardless of the populations involved, or the ways in which the groups in each study had been chosen (Grossman et al., 2010). While some limitations continued to exist across all the studies involved in the meta-analysis in terms of potential methodological issues, the authors indicated that the results overall suggested that mindfulness training might enhance an

individuals ability to cope with distress in everyday life, as well as under increased conditions of disorder or stress (Grossman et al., 2010).

While MBSR is certainly one of the most widely used and studied mindfulness-based interventions (MBIs), it is not the only one that has been developed. For instance, mindfulness-based cognitive therapy (MBCT) combined mindfulness with traditional cognitive therapy interventions for depression, to help people maintain positive changes that have occurred after an episode of depression, and to help them avoid the occurrence of future episodes (Segal et al., 2018). While this program was initially developed solely for the purpose of treating depression in the general population, it has since been applied to a range of psychological disorders, including bipolar and anxiety disorders (Chiesa & Serretti, 2011). Meta-analyses of MBCT found that the treatment was an effective at reducing symptoms and relapse of major depression, with some, though more limited evidence of the programs effectiveness in reducing symptoms in patients with bipolar and anxiety disorders (Chiesa & Serretti, 2011; Xuan et al., 2020).

Still other treatments were developed that integrated parts of the overall construct of mindfulness. One example of such is the acceptance and commitment therapy (ACT) developed in 1999 which was based on a holistic view of science in which all actions need to be viewed in context, looking at their history, purpose and current environment (Hayes, 2004). Through this framework, therapists attempt to assist the client to learn to recognize and accept their thoughts as they are, and to become able to commit to taking necessary actions without regard to the thoughts they may have at the time (Hayes, 2004). The results of several meta-analyses examining ACT have generally shown that ACT is more effective in comparison to placebos in treating anxiety and depression, though it the results of these analyses have been mixed in regards to the efficacy of ACT when compared to existing psychological interventions or active

controls on anxiety and depression treatment (A-Tjak et al., 2015; Hacker et al., 2016; Öst, 2014).

A second example is dialectical behavior therapy (DBT) (Linehan, 1993), which combined principles of learning and crisis theory with aspects of acceptance drawn from principles of Zen Buddhist and western contemplative practices, into a treatment aimed at individuals with borderline personality disorder (BPD) (Dimeff & Linehan, 2001). Meta-analyses have further shown that there is limited, though positive evidence which suggests that DBT is effective in reducing symptomology of BPD (DeCou et al., 2019; Panos et al., 2014). However, while these last two interventions provide some evidence towards the overall efficacy of mindfulness at treating psychological problems, they are limited in that while they include aspects of mindful awareness, there is much less emphasis on a mindful practice (Goldberg et al., 2018), and as such, their efficacy carries less weight towards the overall efficacy of mindfulness in comparison to MBSR or MBCT.

While the above studies and meta-analyses provide evidence towards the overall efficacy of mindfulness in addressing psychological issues in the general population, they are each limited in that they focus solely on individual treatment methodologies and not the construct as of mindfulness as a whole. Several meta-analyses have been done that address this limitation, looking at the efficacy of mindfulness based treatments overall, finding evidence to support the use of mindfulness in schools (Zenner et al., 2014), with teachers (Klingbeil & Renshaw, 2018) and youth (Klingbeil et al., 2017). Studies specifically examining the effects of mindfulness-based treatments overall have further found consistent evidence for the use of mindfulness in the treatment of a variety of psychological problems including depression, anxiety, and stress (Goldberg et al., 2018; Khoury et al., 2013). Furthermore, due to the preponderance of evidence,

mindfulness has been posited as being a potential common factor underlying a variety of different psychotherapies (Martin, 1997). However, the psychological and physiological characteristics of athletes can differ greatly from clinical populations (Birrer et al., 2012), meaning that MBIs may lack some generalizability to sport population subsets.

One such study that helps to bridge this gap between the use of mindfulness interventions in the general population to sport populations was a study done by Shapiro et al. (2005), who specifically investigated the effects of the introduction of a MBSR program into a health care setting in order to assist health care professionals with the stress in their work environment. Shapiro et al. chose this population subset as the stress inherent in health care had been chosen to lead to a wide variety of health issues, including increased depression and psychological distress, as well as reduced effectiveness stemming from decreased focus and concentration, and well as poorer decision-making skills. The researchers found that in comparison to a wait-list control group, there was a significant reduction in perceived stress, significantly increased self-compassion, as well as decreased burnout and decreased distress (Shapiro et al., 2005). As individuals in many sport environments, especially in elite sport, experience high levels of stress endemic to competition, these results provide evidence towards the efficacy of generalizing the benefits of mindfulness in the general population to sport specific populations.

Mindfulness and Sport

In the same way as Jon Kabat-Zinn is generally seen as the first individual in the western scientific practice to investigate the use of mindfulness within clinical populations, he and his team were also the first to investigate the use of MBIs in sport (Birrer et al., 2012). Kabat-Zinn et al. provided mindfulness training to the U.S. Olympic Men's Rowing Team prior to the 1984 Olympics, with several of the medalling athletes reporting afterwards that the program was an

important aspect of their preparation and performance (Kabat-Zinn et al., 1985, as cited in Kaufman et al., 2009). However, even with this apparent early success, applied sport psychology continued to place an emphasis on the use of more traditional cognitive behavioral techniques such as imagery, goal-setting, or arousal management in its pursuit of successful athletic achievement (Whelan et al., 1991). As the third-wave of CBT developed within clinical psychological practices, the newfound focus on acceptance over change, and process over outcome (Hayes, 2004) began to spread to the field of sport psychology as well, leading to the development of several different sport-specific MBIs, with three specific approaches rising to increased prominence (Wilson & Gearity, 2020)

Mindfulness-Acceptance-Commitment. One of the first sport-specific MBIs to be developed was the mindfulness-acceptance-commitment (MAC) based performance enhancement program developed by Gardner and Moore (2004) to potentially extend and increase the effectiveness of the traditional techniques already in use. The MAC approach combined two of the MBIs described above that were used in clinical populations, integrating aspects of both the ACT and MBCT programs, well as a philosophical shift at the time in sport psychology towards the promotion of day-to-day behavioral processes needed for effective athletic development and enjoyment, to create a program specific to athletic populations. Mindfulness then was targeted through the development of a mindful, non-judgemental attention to the present-moment, with acceptance targeted through the cultivation of a willingness to remain in the presence of internal experiences with the understand that they were natural to the human experience (Gardner & Moore, 2004). Lastly, commitment was to be found in the training of one's ability to focus their attention on valued environmental contingencies, such as the process of improvement or sport-specific behaviors required at the present moment.

The MAC program was developed to consist of five distinct phases, delivered either in eight 90 minute group sessions, or twelve 60 minute individual sessions (Gardner & Moore, 2004). The first phase of this program involved psychoeducation, during which participants are provided with information regarding the reasons for the intervention, as well as a discussion of the ways in which the athletes are currently attempting to control their internal experiences, to provide the ability to recognize their relationship to these experiences. The second phase, mindfulness, systematically introduced techniques to help athletes develop a non-judging awareness and attention to internal experiences, focussing on the ability to notice and then let go of negative thoughts and emotions (Gardner & Moore, 2004). The next two phases first involve an emphasis on the distinction between goals and values, with the aim of encouraging effective action consistent with personal values, before turning the focus onto recognizing the connections between thoughts, feelings, and behavior with an emphasis on using acceptance of these connections to allow oneself to essentially disconnect existing automatic connections. Gardner and Moore (2004) outline the final phase of this program as a period of integration and practice, in which athletes are given guidance in combining all of the skills and knowledge acquired in the first 4 phases on the intervention, in both athletic and non-athletic situations.

Over the interceding years, several studies have examined the efficacy of the MAC across a wide variety of concepts related to the development and maintenance of high-level athletic performance. For instance, Lutkenhouse (2007) utilized a case study approach to examining the effectiveness of the MAC approach for a 19-year old female collegiate athlete experiencing performance dysfunction. The athlete in question reported significant improvements in both athletic and school performance, improved social functioning, increased capacity to handle frustration, rejection, and mistakes. Furthermore, coaching reports indicated significant

improvements in her conditioning, overall performance, and adherence to her injury rehabilitation program (Lutkenhouse, 2007). However, this study is limited in that it not only speaks to the program efficacy in one individual, but the study itself was not initially conceived as a formal case study, there is a lack of quantitative outcome measures.

Gross et al. (2018) completed a more recent study that helps to address these limitations. In this case, the authors investigated the effectiveness of the MAC approach on the mental health of female collegiate athletes in comparison to a traditional psychological skills training (PST) program. This was done by splitting the players on a collegiate women's basketball team into two groups, with assessments being completed immediately before and after the 6 week intervention, with further assessments completed by 18 of the athletes at a 1 month follow-up (Gross et al., 2018). They found that at the 1 month follow up, athletes in the MAC group had significantly lowered levels of substance use, hostility and emotion dysregulation in comparison to the PST group. In addition, the participants in the MAC intervention demonstrated reduced anxiety, fewer eating concerns, reduced psychological distress and increased psychological flexibility at the one month follow up (Gross et al., 2018). These results extend the apparent efficacy of the MAC approach in treating the mental health of female collegiate athletes found by Lutkenhouse (2007). However, in the context of sport, both of these studies are limited in that they are generally limited to the use of self-report measures to determine sport improvement.

This limitation was addressed by Zhang et al. (2016) who examined the effectiveness of the MAC intervention on skill acquisition and sport performance in beginners in dart throwing. In order to do this, 43 first year college students were randomly assigned into one of two conditions, an attention control training program or the mindfulness training group, with dart throwing performance, as well as several psychological factors such as mindfulness, flow, and

acceptance, measured immediately pre- and post-intervention, as well as at a two-week follow up. The participants then took part in a 8 week long dart training program lead by a professional dart playing coach, with both groups completing two 30 minute dart throwing training sessions each week (Zhang et al., 2016). Participants in the MAC group then took part in an additional weekly MAC session from weeks 2 to 8, while the participants in the control group took part in weekly sport psychology lectures regarding attention control training during this time frame.

Similarly to the aforementioned studies, they found that the MAC group but not the attention control group had significantly higher scores in all three of the psychological variables mentioned above post-intervention, with the effects staying consistent at the two-week follow up (Zhang et al., 2016). In light of the limitations of the previous studies, the authors found that when they quantitatively examined sport performance improvements, they found that while both groups showed significant improvements from pre- to post-intervention, the MAC group had significantly higher scores than the attention control group. They also found that at the two-week follow up, the MAC group maintained their performance improvements while the attention control group saw a significant decrease in performance. These changes supported the work done by Wolanin and Schwanhausser (2010) who found evidence for the use of the MAC program as a performance enhancement intervention separate from its potential use in the treatment of athlete mental health. While these studies, provide evidence towards the efficacy of the MAC intervention program, it is important to note that this is not the only MBI that has been developed to target sport populations (Wilson & Gearity, 2020).

Mindful Sport Performance Enhancement. A second intervention that has been developed alongside of the MAC approach is referred to as Mindful Sport Performance Enhancement (MSPE). This approach was developed by Kaufman et al. (2009) alongside of the

MAC approach, as an alternate way of extending the concepts found in the MBSR and MBCT interventions to athletes. Similarly to the MAC approach, the MSPE intervention emphasizes the development of mindfulness skills in order to develop a sense of acceptance, through the use of exercises that target the cultivation of mindfulness such as sitting or walking meditations, body scan techniques, and yoga. However, it does differ from the MAC approach in that it was originally developed to last 4 weeks instead of 8-12 weeks, and furthermore does not include the focus on values, value-driven behavior, and commitment characterized in the MAC intervention (Kaufman et al., 2009). Later developments done with the MSPE program have resulted in a 6-session long program, that can be adapted in its delivery based on the sport, group, or individual in question (Kaufman et al., 2018).

The six sessions in the MSPE all share several similar components, with each session including aspects of education, discussion, experience, and home practice (Kaufman et al., 2018). The first session is targeting towards the development of mindfulness fundamentals, and aims to provide the rationale for the program, from a sport-specific perspective, as well as instruction on basic meditation practices like diaphragmatic breathing. The second session extends this a focus on strengthening one's attention abilities, with a focus on present-moment awareness, while the third session is about recognizing the power of expectations and learning to mindfully stretch the bodies limits (Kaufman et al., 2018). The fourth to sixth sessions then focus first on learning to accept what is happening without letting it affect you, practicing embodying the mindful performer, and then how to build an ongoing meditational practice routine, respectively.

The first study investigating the efficacy of the MSPE approach was done by De Petrillo et al. (2009) who looked at the influence of MSPE on a wide variety of psychological

characteristics of competitive long-distance runners in the United States. Using the original 4-week MSPE program with 2.5-3-hour long sessions, the authors compared participants trait sport anxiety, dimensions of perfectionism, cognitive interference, and mindfulness. Although no improvement in running performance was found, they found that the athletes demonstrated significant increases in state mindfulness and trait awareness. Furthermore, the runners exhibited significant decreases in dimensions of sport anxiety and perfectionism, suggesting that the MSPE program may be efficacious for improving athlete's mindfulness, their sport-related worries, as well as certain aspects of perfectionism. However, these results were limited in that there were a small number of participants, who were further limited to only one sport. This limitation was partially addressed in the work done by Kaufman et al. (2009) who similarly found that the MSPE intervention was able to enhance mindfulness, sport confidence, and state flow in a group of competitive archers and golfers. While both of these studies contribute to the overall efficacy for the use of MBIs to target psychological variables in sport populations, both studies failed to show any significant increases in athletic performance across the length of the intervention.

This lack of associated performance improvements as a result of the MSPE program were addressed in a follow up study done by Thompson et al. (2011). In this case, the authors completed a one-year follow up assessment with both the long-distance runners who took part in the MSPE intervention during the work done by De Petrillo et al. (2011), as well as with the archers and golfers who participated in the workshops run by Kaufman et al. (2009). All three of the groups completed the exact same trait measures that they had completed during the pre- and post-workshops, with the runners completing measures of mindfulness, cognitive disruption, sport anxiety, and perfectionism, while the archers and golfers completed measures of mindfulness, cognitive disruption, sport anxiety, sport confidence, and dispositional flow

(Thompson et al., 2011). However, less than half of the participants who had participated in the original research consented to participating in the one year follow up. With that being said, across all groups of athletes, Thompson et al. (2011) found that there were significant increases in mindfulness from post workshop to the follow up, as well as significant decreases in overall sport anxiety and significant decreases in task-irrelevant thoughts (cognitive disruptions). In addition, they found that there were significant decreases in another aspect of cognitive disruptions, task-related worries, when comparing the pre-workshop to follow up scores. Importantly, the authors also found that the long-distance runners exhibited significant improvements their mile times from pre-workshop to the follow up, with significant correlations found between the change in their performance and the change in the measured psychological trait variables (Thompson et al., 2011). Though the authors could not conclude that the mindfulness workshop was directly responsible for the decreases in anxiety, this study does address the above limitations of the two initial studies in that it found that changes in non-judgemental acceptance were associated with decreased mile time, providing more support for the idea that the MSPE intervention may result in long-term psychological changes that in turn lead to enhanced athletic performance (Thompson et al., 2011). However, the strength of this conclusion is limited in that not only were no significant improvements seen at the follow-up in the golfer's performance, but no control group was included in any of these three studies to determine the extent to which the improvements to either performance may be due to the MSPE program over their normal training cycles.

One study that has addressed this limitation was conducted more recently by Chen and Meggs (2021). In this case, the authors were interested in learning the effects of the MSPE intervention on the mindfulness and flow of competitive youth swimmers, and as such compared

the effectiveness of the longer 6 part MSPE intervention (as seen in Kaufman et al., 2018) with a body awareness based relaxation training program. Chen and Meggs (2020) adapted the MSPE program to create an 8-week long intervention, with one workshop each week containing one of the key elements of the MSPE program, adapted to be specific to the youth participants and the nature of the sport. They found that the athletes in the mindfulness condition exhibited significantly higher levels of global trait flow in comparison to the relaxation group. However, the results also indicated that there were no significant improvements in mindfulness across the length of this study, and that the MSPE group did not exhibit higher levels of mindfulness in comparison to the relaxation group (Chen & Meggs, 2021). Taken together with the previous studies mentioned, these results add some support towards the efficacy of using the MSPE intervention to positively influence psychological characteristics of athletes. Overall however, the extent to which the MSPE intervention is able to influence mindfulness and performance is still somewhat limited, due to small group sizes, lack of randomized and controlled studies, and somewhat variable outcomes.

Mindfulness Meditation Training for Sport. The third of the leading sport-specific MBIs that has been developed is the mindfulness meditation training for sport (MMTS) intervention originally outlined by Baltzell and Akhtar (2014). Baltzell and Akhtar identified that one of the limitations of using either the MAC and MSPE programs with competitive athletes was the time demands they placed upon the athletes participating, as the MSPE used sessions 2.5 to 3 hours in length, with up to 45 minutes of practice a day outside of the training sessions, and the MAC approach required hour long sessions for up to 12 weeks. As such, they built the MMTS approach around the idea of using much shorter formal training sessions, as well as with shorter amounts of suggested independent meditation practice (Baltzell & Akhtar, 2014). In

addition to this goal, Baltzell et al. (2014) further included the importance of considering the athlete's subjective experience of participating in the program, something that had not been considered during the development of the other approaches.

The MMTS program that was originally developed included four main areas of focus, namely *open awareness capacity, caring thoughts for self and teammates, concentration exercises,* and *practicing acceptance of negative mind-states*. The first of these, open awareness capacity, focussed on assisting the participants in becoming aware of what was occurring in their lives, both internally and externally, in a passive and non-judgemental manner, while remaining interested in the experiences themselves (Baltzell et al., 2014). Second, participants were guided in transitioning their focus away from the sensory experiences towards developing a focus on caring for both themselves and their teammates positive outcomes in performance, experiencing the positive and warm emotions associated with compassion (Baltzell & Akhtar, 2014). Participants were then provided training on integrating concentration exercises into their practiced non-judgemental awareness, teaching the athletes to be able to choose their point of focus while remaining aware of and accepting all that was occurring around themselves. Finally, participants were instructed in recalling past performances that evoked negative emotions, with the meditation instructor assisting the participants in learning to change their relationships to these negative thoughts by simultaneously practicing the accept and non-judgemental skills learned previously (Baltzell et al., 2014; Baltzell & Akhtar, 2014).

A few years later, Baltzell and Summers (2017b) created the MMTS 2.0 program, which built upon the original MMTS program through the inclusion of the concept of *self-compassion*. Self-compassion involves three main components, a self-kindness, or being kind and understanding to oneself during difficult times, a common humanity, perceiving one's

experiences as being a bonding force with humanity at large instead of being an isolating force, and lastly mindfulness, during which one cultivates awareness of negative experiences while limiting the extent of their influence (Neff, 2003). Studies into self-compassion have found that this concept of self-compassion is able to serve as a buffer against anxiety from ego-threats, with increases in self-compassion associated with increased psychological well-being (Neff et al., 2007). Furthermore, meta-analyses have found large effect sizes in the relationship between self-compassion and overall psychopathology, including depression, anxiety, and stress, where higher levels of self-compassion are associated with lower levels of psychopathological symptoms (MacBeth & Gumley, 2012). Based on these findings, Baltzell and Summers (2017) chose to add self-compassion in the MMTS 2.0 program in order to help competitive athletes deal with the anxieties and sometimes harsh self-criticisms that often accompany high expectations. The goal of this was to help athletes to find the courage to keep going during moments in which these thoughts and emotions feel as though they are overwhelming the skills and strategies the athlete has developed to deal with these situations. Together, this integration of self-compassion training into the MMTS program, led to the creation of a 6 module program covering all of the associated areas of focus, that can be implemented using either two 30 minute session or one 1 hour long session each week, depending on the needs of the athletes in question (Baltzell & Summers, 2017b).

In comparison to the previous sport-specific MBIs discussed, relatively little research exists into the specific efficacy of either the MMTS or MMTS 2.0 programs. In a qualitative study, Baltzell et al. (2014) interviewed seven athletes on a female division 1 collegiate women's soccer team in the United States after participating in the 6 week MMTS intervention in order to understand the athletes experiences with the program, as well as how they felt the program had

impacted them. The athletes interviewed reported that they experienced a new relationship with their emotions on the field, including being better able to moderate high intensity emotions, increased focus, and finding it easier to move past negative occurrences on the field by being able to decide how to react (Baltzell et al., 2014). In addition, they found that the program had helped them with academic stresses and interpersonal challenges outside of the sporting environment. Finally, the athletes also reported that the focus of the MMTS program on discovering direct connections between the meditation practices and their sport enabled them to move past an initial reluctance to fully participate, greatly increasing their attitudes towards mindfulness and meditation overall (Baltzell et al., 2014). However, this study is limited in that no measurements in either mindfulness or other psychological characteristics were involved with this study. This limitation was partially addressed in another study done by Baltzell and Akhtar (2014) who found that female division 1 collegiate athletes who participated in the MMTS intervention exhibited significant increases in mindfulness across the intervention, in comparison to a control group showing no significant changes. Furthermore, they found that while the control group showed significant increases in negative affect, the MMTS participants showed no significant changes (Baltzell & Akhtar, 2014).

Another study that has investigated the efficacy of the MMTS programs was completed by DiBernardo (2018) who investigated the impact of the MMTS 2.0 protocol with a division III collegiate female basketball team and coaching staff in the United States through both quantitative and qualitative outcomes. In this case 15 participants (10 athletes and 5 coaches) completed quantitative measures before and after their participation in the intervention, across a variety of sport-related psychological variables including mindfulness, self-compassion, flow, sport anxiety, and life satisfaction, among others. While the results of the study generally showed

the expected trends towards improvement in these psychological variables, such as increased mindfulness and decreased sport anxiety, none of the quantitative changes approached significance. However, the qualitative results indicated that the participants felt that the mindfulness-training program had resulted in significant positive outcomes, with the themes including enhanced focus and concentration, enhanced stress management and an enhanced team climate (DiBernardo, 2018). Once again, this study provides tentative support for the efficacy of the MMTS program, though it is again limited in power by the small number of participants as well as the lack of a control group. As little other research has been done on these programs, future studies will be needed to determine the effects of the MMTS and MMTS 2.0 program on sport-related psychological variables as well as athletic performance.

Mindfulness-Based Interventions in Sport Overall. Though these three programs each share a common basis in being oriented around the mindfulness training there are several differences that should be noted. First, both the MMTS and MSPE approaches draw their underlying structure and practices from the MBSR program developed by Kabat-Zinn, whereas the MAC approached is an extension to the ACT approach created by Hayes, as well as Gardner and Moore (Wilson & Gearity, 2020). Due to this conceptual difference, both the MSPE and MMTS programs incorporate formal meditation practices into their programs, whereas the MAC approach does not, relying more on an educational approach utilizing lectures and worksheets instead (Wilson & Gearity, 2020). A second key difference is that only the MMTS approach includes the practice of self-compassion, with MSPE only mentioning it in passing, and the MAC approach never mentioning self-compassion at all. Wilson and Gearity (2020) argue that the inclusion of self-compassion suggests that the MMTS approach is more closely aligned with the original Buddhist practices, and is something that has generally been lost in the translation of

mindfulness into western practices. However, while the MAC, MSPE, and MMTS interventions are the most prominent in the field at this time, much of the research done into using MBIs in sport has instead been done using unnamed mindfulness training protocols created specifically for a given study (e.g. Noetel et al., 2019).

Since such a wide variety of MBIs are present in the sport psychological research, several meta-analyses and systematic reviews have been conducted to examine the overall effectiveness of mindfulness in sporting environments. One such review was done by Gardner and Moore (2017), who conducted a brief review of the literature focussed on the use of mindfulness-based interventions in sport. They found some evidence that suggested that in general, mindfulness and acceptance based intervention models have demonstrated consistent benefits in terms of improved psychological and personal well-being, as well as enhanced sport performance among athletes and individuals not in high levels of clinical distress (Gardner & Moore, 2017). However, while this review does provide some useful background information on the breadth of the research currently being conducted, the non-evaluative nature limits any conclusions that can be drawn.

A second systematic review of the overall effectiveness of mindfulness and acceptance based interventions on sport performance was conducted by Noetel et al. (2019). The authors systematically compared 66 articles, looking at the risk of bias within each study, as well as the quality of evidence that exists for mindfulness and acceptance-based interventions on increasing mindfulness and flow, reducing anxiety, and enhancing performance. They found that while the review indicated that there were generally positive effects of the MBIs for athletes in terms of increasing flow, performance, and reducing anxiety, as well as some evidence of effectiveness in injury prevention, reducing burnout, and increasing confidence (Noetel et al., 2019). These

results are supported by the findings of a prior meta-analysis which used standardized mean differences (SMD) obtained using the adjusted Hedge's g, which found generally large effects of MBIs and related interventions on mindfulness scores in athletes (SMD 1.03, 90% CI 0.67–1.40, $p < 0.001$), as well as moderate effects on psychological performance surrogates such as flow and anxiety (SMD 0.72, 90% CI 0.46–0.98, $p < 0.001$) (Bühlmayer et al., 2017). This meta-analysis also found some evidence towards enhanced performance in precision focussed sports such as shooting or dart throwing (SMD 1.35, 90% CI 0.61–2.09, $p = 0.003$) in comparison to a control.

While these reviews and meta-analysis generally indicated positive outcomes from the use of MBIs in sport environment and populations, they also identified several consistent limitations in the existing literature than need to be addressed in the future. For instance, Bühlmayer et al. (2017) indicated that the interplay between MBIs, mindfulness and other psychological performance surrogates was still unclear. Furthermore, the studies included in both of the reviews and the meta-analysis suggested that investigations into the effects of MBIs and mindfulness on psychological variables have been generally limited, with much of the existing research focussed only on anxiety and flow, with little research done into the interplay between mindfulness, other psychological variables such as self-talk or mental imagery, and performance. In addition, Noetel et al. (2019) found that while much of the research has presumed that increases in mindfulness would lead to increases in performance, little to no research has been done to explore whether any variables, psychological or physiological, may mediate the effects of this relationship.

Self-Talk

One such psychological variable that has received minimal attention so far in the existing research on the effectiveness of MBIs in the sporting context is that of *self-talk*. Within the context of sport and exercise, self-talk has been classically described as a multidimensional concept focussing on an athletes verbalizations directed towards themselves, whether out loud or inside their own heads, with these verbalizations serving either motivational or instructional purposes (Hardy et al., 2005). Though much of the research on the effects of self-talk strategies within sport and exercise psychology fall within the past 20 years, examinations into the effectiveness and influences of self-talk strategies within sport can be traced back more than 30 years, though it was not always referred to as self-talk.

One such example of this is the research done by Ziegler (1987), who examined the impact of stimulus cueing on tennis stroke performance in beginners through the use of a 4-step verbal self-cueing program. At around the same time, Rushall et al. (1988) examined the effect of thought content instructions on cross-country skiing performance in elite athletes on the Canadian Cross-Country ski team. Both of these studies provided early evidence for the efficaciousness of using self-talk strategies to increase performance, as the beginner tennis players were shown to have improved on average 45% in comparison to their baseline, and the elite cross-country skiers showed improvements of more than 3%, a substantial increase for athletes at each level respectively. Though neither of these studies directly referred to their interventions as self-talk, both these interventions explicitly referred to verbalizations addressed to oneself, either out loud (Ziegler) or in one's mind (Rushall et al.), and provide support for the impact of self-talk on sport performance. The initial suggested efficacy of self-talk on performance has generally been supported over the years, with one meta-analysis indicating positive moderate effect sizes for self-talk interventions on task performance (Hatzigeorgiadis et

al., 2011), and a systematic review of all the self-talk literature further indicating the beneficial effects of positive, instructional and motivational self-talk on task performance (Tod et al., 2011).

As can be seen in the terms used both in the aforementioned classical definition of self-talk, as well as in both the meta-analysis and systematic review, self-talk within the sport and exercise domain has been traditionally classified within two dichotomous relationships, *positive* or *negative*, and *instructional* or *motivational*. Instructional self-talk involves the use of cues aimed at helping the individual to focus or direct their attention, or to provide technical instruction (Hatzigeorgiadis et al., 2011), and as such is thought to be best suited to precision-based tasks (Theodorakis et al., 2000; Tod et al., 2011). Motivational self-talk meanwhile is focussed on the use of cues that help the individual to increase their motivation, effort, or confidence, as well as create a more positive mood (Hatzigeorgiadis et al., 2011), and is therefore seen as being best suited to tasks characterized by strength and endurance (Theodorakis et al., 2000; Tod et al., 2011). In addition, the type of instructional or motivational self-talk is further described as being positive or negative, with positive self-talk (whether instructional or motivational) seen to aid performance, while negative self-talk negatively impacts performance (Tod et al., 2011). However, in recent years, as research into self-talk has progressed, several developments have occurred which has led to the reconceptualization of the types of self-talk that exist (Latinjak et al., 2019), moving away from the focus on instructional vs. motivational self-talk.

Strategic Self-Talk. The first of these developments was the identification of two distinct types of self-talk that had been previously only seen through two different research perspectives (Latinjak et al., 2019; Theodorakis et al., 2012). Latinjak et al. (2019) refer to these

two distinct types of self-talk as *strategic* or *organic self-talk*. Strategic self-talk is conceptualised as referring to self-referent statements used in a deliberate and purposeful manner, with the skills mostly developed through interventions, and involving the use of cue words or phrases aimed at enhancing performance or achieving other related outcomes. In contrast, the authors describe organic self-talk as referring to the inherent thoughts and statements athletes address to themselves, representing either normal psychological processes, or stemming from metacognitive knowledge and skills (Latinjak et al., 2019). In essence, organic self-talk refers to the types of self-talk that need to be examined when aiming to gain an understanding of self-talk in sport whereas strategic self-talk refers more to the processing of applying psychological techniques to improve performance and performance related outcome in sport.

Of these two types of self-talk, strategic self-talk has seen far greater research interest, as it lends itself towards intervention-based experiments, with direct applications and value (Galanis et al., 2018). These interventions typically involve the use of cue words or phrases used immediately prior to, or while performing a task aimed at enhancing the individuals performance, or facilitating learning (Latinjak et al., 2019). Depending on the function these cue words or phrases are targeting, strategic self-talk can be further broken down into the aforementioned instructional or motivational sub-types of self-talk. However, strategic self-talk encompasses more than just these two sub-types, with other dichotomous forms of self-talk that differentiate based on grammatical structures such as individually-referenced vs. group-referenced self-talk, and declarative vs. interrogative self-talk also being included (Latinjak et al., 2019). Overall, across the entirety of the concept of strategic self-talk, there is now a wealth of

evidence surrounding the effectiveness of these type of self-talk, across a wide variety of tasks, sports, and populations (Galanis et al., 2018).

Organic Self-Talk. While the first major development in self-talk literature was centered on differentiating between strategic and organic self-talk, the second major development centers specifically on organic self-talk (Latinjak et al., 2019). As mentioned above, organic self-talk refers to the inherent thoughts and self-statements that athletes address to themselves, which arise from psychological processes or metacognitive knowledge and skills. The second development then concerns itself with the two different types of self-talk that have emerged over the past decade within this self-talk perspective, namely *goal-directed* and *spontaneous self-talk* (Latinjak et al., 2014).

The first of these, goal-directed thinking, has been defined as a mental process that is deliberately used during the processes of reasoning, problem solving, and decision making (Christoff et al., 2011), which encompasses both the representation of the current and desired state, as well as the link between these two states that attempts to use a series of actions to convert the current state into the desired state (Unterrainer & Owen, 2006). In essence, goal-directed statements or self-talk are used to intentionally make progress on a given task, from either an instructional or motivational focus (Latinjak et al., 2014), but differ from the cue words and phrases used in strategic self-talk in that goal-directed self-talk arises from normal psychological processes instead of being designed as a part of a strategic intervention (Latinjak et al., 2019). While not much research has yet been conducted on the relationship between goal-directed self-talk and performance, there is some evidence that it is beneficial in helping to regulate emotions during competition (Fritsch et al., 2020), as well as assisting with skill acquisition (Latinjak et al., 2018). Furthermore, goal-directed thoughts have been found to be

used to regulate concentration, activation, and for cognitive reappraisal of different tasks, with this type of thinking becoming more prevalent during competition (Latinjak, 2018).

In contrast to this, spontaneous self-talk or spontaneous thoughts can be defined as thoughts that are linked to the task at hand and are focussed on relevant stimuli but are unintentional, non-working, and non-instrumental thoughts that come to mind effortlessly and unprompted (Latinjak et al., 2014). Specific to the sporting context, spontaneous self-talk refers to an intuitive type of self-talk that is fast, effortless, focusses one's awareness on current experiences and is emotionally charged (Latinjak et al., 2019; Van Raalte et al., 2016). Research has further indicated spontaneous self-talk can be broken down into two separate dimensions, namely valence (whether it is positive or negative) and time-perspective (retrospective, or prospective) (Latinjak et al., 2014, 2019).

Though little research has been done into the specific effects of spontaneous self-talk on sport performance, there is evidence that spontaneous thinking has positive effects on a wide range of cognitive domains, including some relevant to performance (Christoff et al., 2011). In a review of the literature, Christoff et al. (2011) found evidence to suggest that spontaneous thoughts provide benefits to later goal-directed thinking, as well as enhancing creativity, and emotional processing, enabling increased specificity of motivational focus, and benefitting decision making, especially in complex situations. Though not investigated specifically within the sporting context, many of these general cognitive benefits of spontaneous thought would seem to be beneficial to athletes who are required to rapidly make complex decisions under high levels of stress, as well as being able to stay motivated and focused on specific targets over long periods of time in order to maximize their performance during competition. Overall, though the various types of self-talk have been shown to have demonstratable effects on sport performance

(Christoff et al., 2011; Galanis et al., 2018; Hardy et al., 2018; Latinjak et al., 2019), it is this concept of spontaneous self-talk that is of greatest interest in the context of this study.

Mindfulness and Spontaneous Self-Talk

Within the self-talk literature, emotions and behaviours are seen to be, at least in part, a product of one's thoughts and internal dialogue when they occur alongside a behavior of interest, or during the completing of a desire or required task (Birrer et al., 2020). As such, in order to be able to alter or modify these behaviors in a desired manner, one must first be able to find a way to modify this organic internal dialogue. As previously been noted, research in self-talk has focussed on accomplishing this through the use of strategies such as cue words, or through interventions promoting goal-directed self-talk. However, Birrer et al. (2020) recently suggested that another alternative to these approaches may be through the use of mindfulness- and acceptance-based interventions.

It can be viewed that the concepts of mindfulness and self-talk share associations with a particular state of consciousness, as in both cases the concepts require the individual to be consciously aware of both their internal and external experiences, though the concept of self-talk is limited to awareness of specific cognitive elements, whereas mindfulness is aimed at an awareness of physical, mental, and environmental states (Birrer et al., 2020). Though there are stark differences in the applied uses of self-talk interventions and MBIs, as the former aims to change the content of an individual's internal dialogue (e.g. Hatzigeorgiadis et al., 2011), while the latter seeks to change the individuals relationship to the content instead of the content itself (e.g. Baltzell & Akhtar, 2014; Gardner & Moore, 2012), several commonalities do exist. For instance, both self-talk and MBIs seek to cultivate an increased metacognitive awareness for the individual, and both approaches acknowledge that although one's internal dialogue may

represent their perception of reality, it does not necessarily represent an objective view of their reality at that time (Birrer et al., 2020).

As mindfulness is related to the ability to be both aware and accepting of one's internal and external experiences of the present moment (Baltzell et al., 2014), and spontaneous thoughts are defined as being intuitive thoughts centered around one's current experiences, it can be logically extended that one of the effects of MBIs is to increase the individuals metacognitive awareness of their spontaneous thoughts. This increased awareness, alongside of the acceptance that is central in most MBIs, may then provide an avenue through which the content of an individual's spontaneous self-talk is able to be altered, as the individuals gain the ability to choose which thoughts they hold onto and which they discard (Birrer et al., 2020). In essence, increased levels of mindfulness and acceptance would allow the individual to simply view their internal dialogue as a tool they can choose to use to aid in their pursuit of their goals. As the individual learns to control their response to non-functional self-talk, it follows that more positive self-talk and less negative self-talk is likely to occur organically and in particular, spontaneously in the future.

However, though these relationships and similarities between organic self-talk and mindfulness appear to be clear in the literature, and follow when considered logically, little evidence exists as to the actual nature of the relationship between mindfulness and self-talk, and especially spontaneous self-talk. In the literature, there is some evidence that suggests that increased mindfulness leads to fewer task-irrelevant thoughts or cognitive disruptions (Thompson et al., 2011). Other research has similarly suggested that both negative and positive automatic self-talk is moderately correlated to mindfulness levels, and together can predict a significant amount of the variance in levels of mindfulness among athletes (Bervoets, 2013).

Other reviews outside of sport in specific suggest that mindfulness and acceptance approaches may be an effective model that can facilitate the goal of reducing levels of worry and anxiety in individuals with generalized anxiety disorder, specifically due to the potential relationship of mindfulness to the verbal-linguistic nature of worry (Roemer & Orsillo, 2002). This ability of mindfulness and acceptance to influence these verbal-linguistic functions may be of import to increasing performance, as studies have shown that high-performing athletes in sports such as golf, archery, and marksmanship demonstrate decreased levels of left-hemisphere cortical activity, which is indicative of reduced verbal-linguistic activity (Gardner & Moore, 2004). However, although these bits of evidence exist to support the relationship between mindfulness and self-talk, to the knowledge of the researcher however, no research has yet experimentally assessed the relationships between mindfulness, spontaneous self-talk, and athletic performance.

Objectives

As a result of these gaps in the literature, as well as the seemingly logical though theoretically relationship between mindfulness and spontaneous self-talk this research project set out to accomplish several goals. First, this project aimed to provide more support for the positive relationship between mindfulness and sport performance. It was hypothesized that there will be a significant increase in mindfulness in the group participating in the mindfulness intervention, as well as an associated significantly greater increase in sport performance in comparison to a control group, when compared to their abilities prior to the mindfulness intervention. Second, this project intended to address an existing gap in the literature by examining the nature of the relationship between spontaneous self-talk and mindfulness, in order to provide evidence for the theoretical relationships suggested previously. For this, it was hypothesized that increases in mindfulness would be positively associated changes in positive spontaneous self-talk, both

retrospective and prospective, and would be negatively correlated with changes in negative spontaneous self-talk.

The final main objective of this experiment was to address the gap noted by Noetel et al. (2019) in that while much of the research has presumed that increases in mindfulness would lead to increases in performance, little to no research has been done to explore whether any variables, psychological or physiological, may mediate the effects of this relationship. As such, this project aimed to assess the extent to which changes in spontaneous self-talk that occur as a result of the mindfulness intervention would serve to mediate the expected positive relationship between mindfulness and performance.

Methods

Participants

Power Analysis. Prior to commencing the project, a power analysis was performed using g*power 3.1 (Faul et al., 2009) to determine the required number of participants, based on the expected effect size. The expected effect size for mindfulness on performance was based on the effect sizes indicated in one recently published meta-analysis (Bühlmayer et al., 2017), as well as a recently published systematic review (Noetel et al., 2019), which together suggested that an effect size of between 0.25 and 0.4 could be expected from our study. Based on this range of effect sizes, power analyses indicated that between 20-30 participants would likely provide enough power for this study.

Overall, 30 female football (soccer) players consented to participate in this research project, with an initial 16 in the experimental group, and 14 in the control group. Athletes were drawn from two women's football clubs in Greece, with all athletes from the same team being placed in the same group. Both clubs consisted of athletes in a similar age range, and who were

both competing in the top division of the Greek national women's league, with one team in the north division and the other in the south division. After consenting, 2 athletes, 1 from each group, were unable to participate in the initial data collection due to injury or last-minute schedule conflicts. As well, at the end of the experiment, a further 4 athletes in the experimental group and 1 athlete in the control were unable to complete the final data collection due to last minute scheduling conflicts, leaving a total of 23 athletes who completed the experiment.

Experimental Group. The participants in the experimental group were drawn from athletes currently registered to play with the Glyfada Women's Football Club (Glyfada WFC), based out of Athens, Greece, currently competing in the south group in division 1 of the Greek National Women's Football League. The 11 athletes who completed the entire experiment were aged between 15 to 32 ($M = 24$, $SD = 5.04$). The athletes had been between 6 and 17 years ($M = 12.36$, $SD = 4.01$) of football experience, with an average of 2.45 years ($SD = 3.62$) spent with their current club. Athletes further indicated the highest level they had competed at in their careers, with 7 competing at a national level, and 4 having competed internationally.

In order to recruit participants, researchers first contacted the head coach and board of Glyfada WFC, and after gaining permission from both, met with the athletes one week prior to the start of the experiment. At this time, it was explained to the athletes that we were looking for participants for a research study investigating the relationship between mindfulness and football performance. Athletes were informed that the research would last for approximately eight weeks, and would require them to participate in 2x30min mindfulness training sessions weekly prior to training, as well as for them to spend 5-10 minutes a day practicing meditation outside of these training sessions, in addition participating in assessments the weeks immediately before and after the mindfulness training program started and concluded. No material rewards were offered for

participation, but participants were informed that it was expected that the mindfulness training program would be beneficial for their overall football performance. Prior to the commencement of this research project, the researchers had no formal relationship with either this football club, or any individual athletes on this team, and as such no of the athletes had been introduced to any of the concepts of mindfulness. Demographic characteristics are presented in Table 1.

Control Group. The control group consisted of 12 female football players between the ages of 15 and 25 ($M = 18.08$, $SD = 3.18$), playing for the AO Trikala 2011 women's football team based out of Trikala, Greece, and who were also competing in division 1 of the national league. The athletes had between 3 and 16 years of football experience ($M = 8.67$, $SD = 3.89$), spending an average of 5.71 years ($SD = 2.56$) with their current club. Three players indicated that the highest level they had competed was in international competition, while the other 9 indicated that the highest level they had competed at was national.

Participants were recruited in a similar manner, with the researcher's first getting approval from both the head coach and club president, before speaking to the athletes. Participants were informed that they would be participating in a research project investigating the relationship between mindfulness and performance that would last for 8 weeks. The athletes were further told that if they consented to participate, they would be required to participate in some assessments during the first and last weeks, but that there would be no other requirements. Once again, no material rewards were offered for their participation. Prior to the commencement of this research project, the lead researcher had been formally working as a sport psychology consultant with the athletes on this football club for the last year and a half, and as such had previous relationships built with the athletes. As such, all athletes were informed prior to the research beginning that this existing working relationship would not be affected based on

whether or not they chose to participate in the research project. However, due to this prior

relationship, several of the athletes on this team had already been introduced to several of the

Table 1

Demographic characteristics for Experimental and Control Groups

Demographic Characteristics	Experimental			Control		
	M	*SD*	Range	*M*	*SD*	Range
Age	24	5.04	15-32	18.08	3.18	15-25
Years of Football Experience	14.45	4.99	6-22	8.67	3.89	3-16
Years of Experience in Competitive Football	12.36	4.01	6-17	6	3.59	2-15
Training Hours per Week	10.23	1.33	8-12	10.17	2.12	7-15
Years with Current Team	2.45	3.62	1-12	5.71	2.56	1.5-10
Times Meditation Used Weekly, Pre-Intervention	0[a]	0[a]	N/A[a]	1.67	1.45	0-5

Note. All values are rounded to 2 decimal places. *M* = Mean, *SD* = Standard Deviation

[a] None of the participants in the experimental group reported using meditation in any form prior to the beginning of the intervention.

concepts of mindfulness and mindfulness meditation, though not through a structured

mindfulness meditation intervention. Demographic characteristics are presented in Table 1.

Procedure

Initial Session. At the very start of the experiment, the researchers conducted an initial

session to explain the project, receive informed consent from all participants, and administer the

two initial questionnaires, with the first regarding demographic information such as age, years of

experience and highest level of competition, with the MIS questionnaire administered second to

measure athletes initial mindfulness levels. This session, similar to all subsequent training and

assessment sessions, was conducted immediately prior to the athletes normally scheduled

training.

As it was known ahead of time that several of the athletes who were interested in

participating were under the age of 18, and would therefore require consent from their parents or

guardians who often do not attend training sessions, the coaches obtained verbal consent from

their parents for their children to participate in the research ahead of time. This allowed the

researchers to administer this initial questionnaire to the younger participants during this initial

session as well, with the athletes under the age of 18 whose parents were not at training taking

the informed consent home for their parents to sign, and returning it during the next session.

Assessment Phase. Assessments were conducted in weeks 1 and 9 of the overall training

program, using the same procedure for both groups. Upon arrival, athletes were sorted into

groups of 4-6 participants, with the initial group then instructed to complete a 5- to 10-minute-

long warm-up, simply following the normal warm up they do at the start of each training session.

After completing the warm-up, participants in group 1 were then called over to one end of the

field, where they were instructed in the shooting task, and shown a picture of the scoring guide,

as outlined below (see Figure 1). In addition, at this time participants were told that they would have 10 shots, with the goal of getting as high of a score as possible. No other instructions were provided, though athletes were free to ask for clarification about the scoring guide as needed. Each participant in the group completed all 10 of their shots before the next participant started the shooting task. The rest of the participants in the group, who were not shooting at the time, were responsible for retrieving and returning the footballs in between shots.

Once all of the participants in group 1 had completed all 10 shots, they were asked to retrieve all of the balls, then return to the researchers. The researchers then administered both the spontaneous self-talk questionnaire, as well as a state flow questionnaire. As the research was being conducted outdoors, all participants were provided with pens and clipboards, and then instructed to find a quiet area to complete the questionnaires, and to return the questionnaires to the researchers when completed. The participants were informed that if they had any questions about the questionnaires, to please call over one of the researcher's so that any confusion could be clarified. Once all of the athletes in group 1 had begun work on their questionnaires, the researchers asked the athletes in group 2 to begin their warm-ups, so that they were ready to start the shooting task as soon as all the athletes in group 1 had completed their questionnaires. The above steps were then repeated until all athletes had completed both the shooting task and questionnaires.

Football Shooting Accuracy Performance Assessment. In order to assess football performance a modified version of the Loughborough Soccer Shooting Test (LSST; Ali et al., 2007) was used. This assessment used the shooting accuracy scoring system developed for the LSST, in which the football goal is divided into a set of different zones, with a variety of points allocated for each area, ranging from 1 point in the center of the goal, to 5 points at the corners,
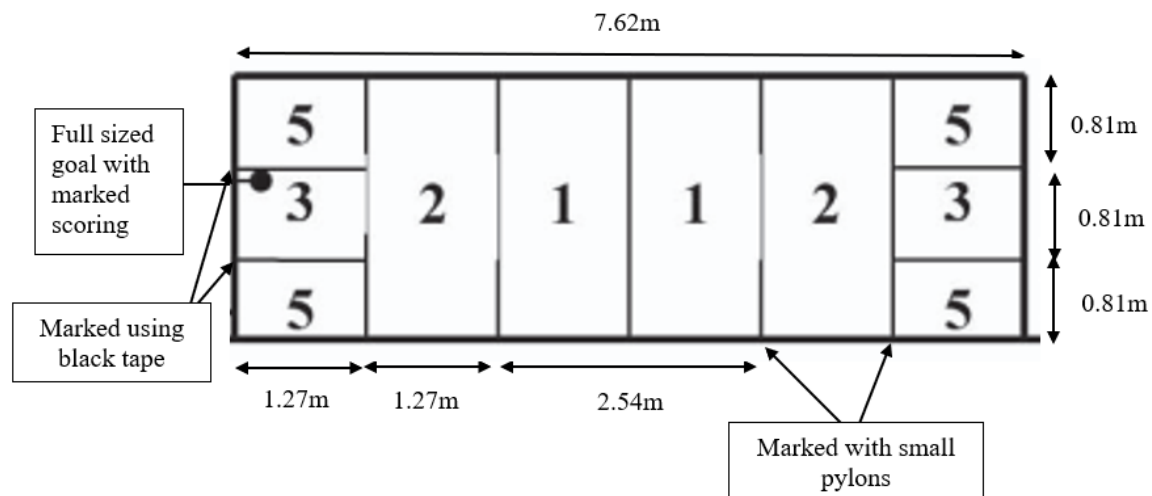
Figure 1. The scoring system used for the Football Shooting Accuracy Performance Task, adapted from the Loughborough Soccer Shooting Test, as developed by Ali et al. (2007)

with the various zones marked out so that the athletes could see where the differences were (see Figure 1). If participants missed the net entirely, then they were awarded 0 points for that shot, and if participants shots hit exactly between two zones, the points for each zone were averaged to provide a score for that shot (e.g., a shot in between zones worth 2 and 5 points was recorded as a score of 3.5). All participants were shown a picture of the scoring system, as well as provided with information about how the different areas were marked in the goal. As well, similarly to the LSST a square shooting area was created, though it was modified to measure only 3m x 3m instead of 8.5m x 8.5m, and was placed with the front of the scoring area located 20m away from the goal line, in the center of the net instead of 16.5m away from the goal line as in the LSST. As well, due to time constraints present for the assessment phases of this experiment, the LSST was modified after this point, with participants simply receiving instructions to take 10 stationary game shots from anywhere they chose within the specified 3x3m square. No instructions were given regarding the time between each shot, or the speed at which the ball needed to move. The researcher scored each shot as it was taken, with participants able to view the raw score numbers after all 10 shots, if desired.

Intervention Phase. For the experimental group, the MMTS 2.0 program was completed on weeks 2-8 of the overall experiment, while the control group was simply asked to continue with training as normal during this time. As outlined below, the mindfulness training was delivered in two 30-minute blocks on two separate days each week (one day for each part), and was completed in the 30 minutes immediately prior to the athletes normal training schedule. Every effort was made to deliver this intervention on the same days each week; however, changes made by the Greek football federation to the leagues match schedule after the experiment had begun necessitated some changes to be made based on when the team would be

available. All athletes, and the team were consulted about these changes to find the best alternatives, and were informed as early as possible once a decision had been made about the new days for the affected weeks. Further, mid-way through the experiment due to multiple matches occurring in close succession, the Glyfada WFC only had one training session, and as such were not available to complete both of the required weekly sessions, leading to the researcher's deciding to simply move the timeline of the experiment back one additional week to compensate.

Materials

Mindfulness Questionnaire. Participant mindfulness levels were measured through the use of the Mindfulness Inventory for Sport (MIS). For use in this study, the questionnaire was translated into Greek by the supervising professor who is fluent in both English and Greek (see Appendix A). This questionnaire consists of 15 statements measuring three factors, *awareness, non-judgmental,* and *refocusing*, where participants indicated the extent to which each statement was reflective of their recent experience using a six-point scale ranging from *1 = not at all* to *6 = very much*. Thienot et al. (2014) provided support for the psychometric properties of the MIS, finding acceptable levels of internal consistency for the awareness subscale ($\alpha = .70$), acceptance subscale ($\alpha = .72$), and the refocussing subscale ($\alpha = .79$). In addition, the MIS was found to demonstrate the expected significant correlations with the Mindful Attention Awareness Scale, which is the questionnaire most commonly used to assess mindfulness in non-athletic settings and populations (Thienot, 2014). Further support for the both the cross-cultural use of this scale, as well as the psychometric qualities of the MIS was demonstrated by Doron et al. (2020) who used a French adaptation to measure mindfulness in young elite badminton players before and after a MBI, finding acceptable internal consistency and reliability for awareness ($\alpha_{T1} = 0.70$, α_{T2}

= 0.76), non-judgemental (acceptance) ($\alpha_{T1} = 0.76$, $\alpha_{T2} = 0.78$), and for refocussing ($\alpha_{T1} = 0.61$, $\alpha_{T2} = 0.78$).

Self-Talk Questionnaire. The questionnaire used to measure spontaneous self-talk in athletes was based on the Automatic Self-Talk Questionnaire for Sports (ASTQS), developed by Zourbanos et al. (2009). In the initial development of this questionnaire, the subscales of the ASTQS have demonstrated strong internal consistency ($\alpha = .79$ to $\alpha = .94$), as well as the expected significant correlations to related variables as measured by previously validated scales (Zourbanos et al., 2009). However, in order to only measure spontaneous self-talk, the instructions were adjusted to reflect this difference, based upon the latest conceptualizations of self-talk (Latinjak et al., 2019), with the resulting spontaneous self-talk questionnaire provided to the athletes (see appendix B). This questionnaire consists of 20 statements measuring 4 separate types of self-talk, *positive prospective*, *positive retrospective, negative prospective,* and *negative retrospective*. For each of the 20 statements, participants indicated how often during the shooting performance task they spontaneously told themselves something similar using a 5 point likert scale, ranging from *0 = never* to *4 = very often*. This spontaneous self-talk questionnaire is also currently undergoing psychometric evaluation as a part of a new dual-scale self-talk questionnaire addressing spontaneous and goal-directed (organic) self-talk that is currently in development.

Mindfulness Intervention. The program used in this study was based on the mindfulness meditation training for sport 2.0 (MMTS 2.0) protocol as described by Baltzell and Summers (2017a) as it was specifically designed for competitive athletes and therefore was well suited to the study population. The MMTS 2.0 program is a six-hour intervention designed to be implemented through two 30-minute intervention sessions a week for six weeks, which focusses

on strengthening athletes attention, concentration, poise and adaptability through the use of mindfulness, acceptance, and self-compassion. Each 30-minute session consisted of three sections, lasting about 10 minutes each, with information about the topic of focus provided in the first section, a researcher-led guided meditation in the 2nd, and then a final discussion between athletes and the researcher about ways in which the information and focus of the meditation could be applied to football or their lives. In addition, a formal meditation practice was implemented by providing audio files of guided meditations, with participants being asked to meditate for about 10 minutes a day for most of the days that they do not have any mindfulness training sessions. For use in this research, all presentations, guided meditations, and other training materials were developed in English, closely following the materials provided by Baltzell and Summers (2017), and were then translated into the Greek language by one of the researchers who is fluent in both languages.

Mindfulness Program Evaluation Questionnaire. This questionnaire was provided to the athletes at the end of the experiment, in order to gather some data regarding their thoughts and opinions of the mindfulness intervention used in this experiment. The questionnaire consisted of five statements, each answered on a 5-point likert scale ranging from *1 = strongly disagree* to *5 = strongly agree* (see Appendix C). Participants were instructed to indicate the extent to which they agreed with each statement, and were informed that responses would only be used in aggregate, not to investigate individual opinions about the program.

Data Analysis

Preliminary Analyses. Several initial preliminary analyses were carried out to ensure that there were no inherent complications with the data. The first of these removed all of the data for the participants from each team that had not been able to complete the entirety of the

experiment. The second preliminary check screened all of the remaining data for missing values, finding that none of the remaining participants had significant numbers of missing values, and as such no further participants were removed from the final analysis. Finally, the pre-intervention reliability for the mindfulness inventory for sport (MIS) and the spontaneous self-talk questionnaire (SPSTQ) was testing by calculating the Cronbach's alpha values in order to measure internal consistency for each of the questionnaires.

Baseline Analysis. As a control for potential issues in the data, a series of Welch's two sample t-tests were used to check to see if there were any significant differences between groups on mindfulness, spontaneous self-talk, or performance prior to the mindfulness intervention. This was done in order to ensure that no significant differences existed on any of the variables prior to the intervention between groups that may have impacted the results of later analysis, beyond the changes expected through the mindfulness training program.

Results

Preliminary Analyses

Pre-intervention reliability analyses indicated that three of the four factors of the SPSTQ had acceptable levels of internal consistency, with alpha levels of .79 for positive prospective, .74 for positive retrospective, and .73 for negative prospective. However, the results of this analysis indicated poor internal consistency for the negative retrospective subscale ($\alpha = .54$). This analysis further indicated good levels of internal consistency for both the non-judgemental ($\alpha = .88$) and refocussing subscales ($\alpha = .82$), but also indicated poor levels of internal reliability for both the awareness subscale ($\alpha = .51$) and the overall mindfulness score ($\alpha = .54$).

Baseline Differences

Next, a series of Welch's two samples t-tests were completed, which indicated that there were no significant differences between groups prior to the intervention for overall mindfulness, $t(19.9) = -.14$, $p = .892$, the individual mindfulness factors of awareness, $t(20.2) = -.33$, $p = .745$, non-judgement, $t(20.2) = -.50$, $p = .620$, and refocussing, $t(20.2) = .56$, $p = .58$. Similarly, t-tests indicated that there were no significant differences for positive prospective, $t(19.5) = -.19$, $p = .851$, positive retrospective, $t(19.9) = .59$, $p = .562$, negative prospective, $t(17.2) = -.94$, $p = .361$, or negative retrospective self-talk, $t(20.6) = -.54$, $p = .596$, with a final t-test indicating that that there were no significant differences between groups on shooting performance prior to the intervention, $t(19.3) = -1.27$, $p = .218$ (see Table 2 for descriptive statistics).

Objectives Testing

Change Over Time. In order to examine whether there had been any changes in mindfulness, spontaneous self-talk or shooting accuracy performance over the course of the project a series of ANOVAs and MANOVAs were performed, with each using a two-way (2 x 2) design with one repeated factor (time) and one between-subjects factors (experimental condition). First, a mixed methods 2 x 2 ANOVA was done to examine changes in overall mindfulness, finding that there were non-significant main effects for both time, $F(1, 21) = .86$, $p = .366$, partial $\eta^2 = .04$, and condition, $F(1, 21) = .09$, $p = .774$, partial $\eta^2 = .004$, as well as a non-significant interaction effect $F(1, 21) = .10$, $p = .750$, partial $\eta^2 = .01$. Second, a two-way MANOVA was used to test for difference over time and between groups for each of the three mindfulness factors. The results of this test indicated that there was a non-significant multivariate main effect for time, Pillai's Trace = .06, $F(3, 19) = .41$, $p = .748$, partial $\eta^2 = .06$, as well as a non-significant multivariate main effect for experimental condition, Pillai's Trace = .18, $F(3, 19) = 1.37$, $p = .281$, partial $\eta^2 = .18$. In addition, this analysis revealed a non-significant multivariate

Table 2

Pre-intervention descriptive statistics for all variables separated by group

		Experimental		Control	
		M	*SD*	*M*	*SD*
Mindfulness					
	Overall Mindfulness	62.29	5.43	61.92	7.56
	Awareness	24.18	2.68	23.75	3.57
	Non-Judgemental	15.66	5.36	14.42	6.49
	Refocussing	21.74	2.97	22.50	3.50
Self-talk					
	Positive Prospective	14.73	2.72	14.46	4.00
	Positive Retrospective	12.73	2.33	13.42	3.23
	Negative Prospective	6.41	4.26	4.98	2.84
	Negative Retrospective	8.39	2.89	7.75	2.77
Accuracy					
	Shooting Performance	19.50	6.94	16.12	5.64

Note. All values rounded to 2 decimal places. $n = 11$ for the Experimental Group; $n = 12$ for Control Group. M = Mean, SD = Standard Deviation.

condition by time interaction effect, Pillai's Trace = .16, $F(3, 19) = 1.24$, $p = .322$, partial $\eta^2 =$ .16. The descriptive statistics for the above analyses can be found in Table 3.

Next, another two-way mixed methods MANOVA was done to test for any changes over time or differences between groups for each of the four spontaneous self-talk factors. The results of this analysis indicated that there was a non-significant multivariate main effect for time, Pillai's Trace = .18, $F(4, 18) = 1.00$, $p = .431$, partial $\eta^2 = .18$, a non-significant multivariate main effect for condition, Pillai's Trace = .17, $F(4, 18) = .95$, $p = .459$, partial $\eta^2 = .17$, and a non-significant multivariate interaction effect between time and condition, Pillai's Trace = .06, $F(4, 18) = .26$, $p = .898$, partial $\eta^2 = .06$. The descriptive statistics for this analysis are presented in Table 4. A final two-way mixed methods ANOVA was then done to test for differences in performance on the shooting accuracy task over time and between groups. This analysis revealed that there were non-significant main effects for time, $F(1, 21) = .41$, $p = .530$, partial $\eta^2 = .02$, between groups, $F(1, 21) = 1.60$, $p = .220$, partial $\eta^2 = .07$, and there was a non-significant interaction effect in the amount of performance change over time between groups, $F(1, 21) = .32$, $p = .580$, partial $\eta^2 = .02$ (see Table 5 for descriptive statistics).

Relationships Between Factors. In order to examine the relationships between spontaneous self-talk, mindfulness, and shooting performance, a series of Pearson's correlations were performed which looked at the relationships between each variable prior to the mindfulness intervention. The results of these analyses indicated that overall mindfulness had a significant positive correlation with both positive prospective (r(21) = .41, $p = .050$ and positive retrospective self-talk (r(21) = .53, $p = .010$). As well, the results of the Pearson correlation indicated that there were significant positive associations between the mindfulness factor of refocussing and both positive prospective (r(21) = .51, $p = .013$), and positive retrospective self-

Table 3

Marginal means for all mindfulness factors from 2x2 mixed methods ANOVA and 2x2 mixed methods MANOVA

			M	*SE*	95% CI LL	95% CI UL
Overall Mindfulness						
	Condition	Control	61.25	1.71	57.69	64.81
		MMTS	61.97	1.79	58.25	65.69
	Time	Before	62.10	1.38	59.23	64.98
		After	61.12	1.31	58.39	63.84
Awareness						
	Condition	Control	22.92	.85	21.15	24.69
		MMTS	24.50	.89	22.66	26.35
	Time	Before	23.97	.66	22.59	25.35
		After	23.45	.71	21.97	24.93
Non-Judgement						
	Condition	Control	15.25	1.50	12.14	18.37
		MMTS	15.60	1.56	12.35	18.87
	Time	Before	15.04	1.24	12.45	17.63
		After	15.81	1.10	13.52	18.11
Refocussing						
	Condition	Control	22.46	.88	20.63	24.29
		MMTS	21.46	.92	19.56	23.37
	Time	Before	22.12	.68	20.71	23.54
		After	21.80	.71	20.32	23.28

Note. All values rounded to 2 decimal places. *M* = mean, *SE* = standard error, CI = confidence interval, LL = lower limit, UL = upper limit.

Table 4

Marginal means for all spontaneous self-talk factors from 2x2 mixed methods MANOVA

			M	*SE*	95% CI LL	95% CI UL
Positive Prospective						
	Condition	Control	15.07	.83	13.35	16.80
		MMTS	14.96	.87	13.15	16.76
	Time	Before	14.59	.72	13.10	16.09
		After	15.44	.62	14.16	16.71
Positive Retrospective						
	Condition	Control	13.67	.80	11.99	15.34
		MMTS	13.09	.84	11.34	14.84
	Time	Before	13.07	.59	11.84	14.30
		After	13.69	.72	12.18	15.19
Negative Prospective						
	Condition	Control	4.95	.98	2.90	6.99
		MMTS	6.71	1.03	4.57	8.84
	Time	Before	5.69	.75	4.14	7.25
		After	5.96	.80	4.30	7.61
Negative Retrospective						
	Condition	Control	8.29	.82	6.58	10.00
		MMTS	9.10	.86	7.32	10.89
	Time	Before	8.07	.59	6.84	9.30
		After	9.33	.80	7.67	10.98

Note. All values rounded to 2 decimal places. *M* = mean, *SE* = standard error, CI = confidence interval, LL = lower limit, UL = upper limit.

Table 5

Marginal means for 2x2 mixed method ANOVA for shooting accuracy performance

		M	*SE*	95% CI LL	UL
Condition	Control	16.06	1.35	13.27	18.86
	MMTS	18.52	1.40	15.60	21.44
Time	Before	17.81	1.31	15.08	20.54
	After	16.77	1.22	14.23	19.31

Note. All values rounded to 2 decimal places. *M* = mean, *SE* = standard error, CI = confidence interval, LL = lower limit, UL = upper limit.

talk (r(21) = .48, *p* = .021. No other significant correlations were found (see Table 6).

Mediation. The final objective of this experiment aimed to examine the interrelationships between mindfulness, spontaneous self-talk, and performance by testing to see if changes in self-talk would mediate the expected relationship between mindfulness and performance. First, difference scores were first calculated for all mindfulness and spontaneous self-talk factors, as well as shooting performance, then Pearson's correlations were performed for all combinations of overall mindfulness, the three mindfulness factors of awareness, non-judgement, and refocussing, the four spontaneous self-talk factors of positive or negative prospective or retrospective self-talk, and shooting performance. The results of this analysis revealed that there were no significant correlations between the difference scores for any of the above factors (see Table 7).

Although no prior significant correlations were found between mindfulness, performance, and any of the self-talk factors, mediation analyses were still carried out to ensure that there were no previously undetected relationships. Four mediation analyses, one for each of the 4 self-talk factors were conducted, to determine if changes in any of the types of self-talk mediated the relationship between changes in overall mindfulness and changes in performance. These analyses used non-parametric bootstrapping as a part of the mediation analysis to compute unstandardized indirect effects for each of 1000 bootstrapped samples. This analysis revealed that there were non-significant indirect effects for positive prospective (*b* = .02, 95% CI [-.09, .28], *p* = .71), positive retrospective (*b* = -.10, 95% CI [-.61, .14], *p* = .45), negative prospective (*b* = .00, 95% CI [-.23, .13], *p* = .85), and negative retrospective self-talk (*b* = .00, 95% CI [-.20, .18], *p* = .94). All unstandardized regression coefficients are shown in Figure 2.

Program evaluation. A final analysis was done to examine the self-reported outcomes

Table 6

Pre-intervention correlations for mindfulness, spontaneous self-talk and shooting performance

| | Performance | Positive | | Negative | |
		Prospective	Retrospective	Prospective	Retrospective
Ovr.	-.19	.41*	.53*	.02	-.08
Awr.	-.03	.40	.37	-.10	.13
NJ	-.21	-.14	.06	.33	.04
Rfcs	-.01	.51*	.48*	-.15	-.17
Performance	-	-.22	-.14	.26	.26

Note. All values rounded to 2 decimal places. Pearson's Correlations are presented for all combinations of variables. Ovr = Overall Mindfulness, Awr = Awareness, NJ = Non-Judgement, Rfcs = Refocusing.

* $p \leq .05$

Table 7

Correlations between the difference scores for mindfulness, spontaneous self-talk and shooting performance

		Positive		Negative	
	Performance	Prospective	Retrospective	Prospective	Retrospective
Ovr.	-.29	.07	.37	.17	.01
Awr.	-.08	-.10	.18	.01	.24
NJ	-.20	.27	.17	.16	-.01
Rfcs	-.16	-.14	.26	.12	-.24
Performance	-	.21	-.26	-.04	.08

Note. All values rounded to 2 decimal places. Pearson's Correlations are presented for all combinations of variables. Ovr = Overall Mindfulness, Awr = Awareness, NJ = Non-Judgement, Rfcs = Refocusing.
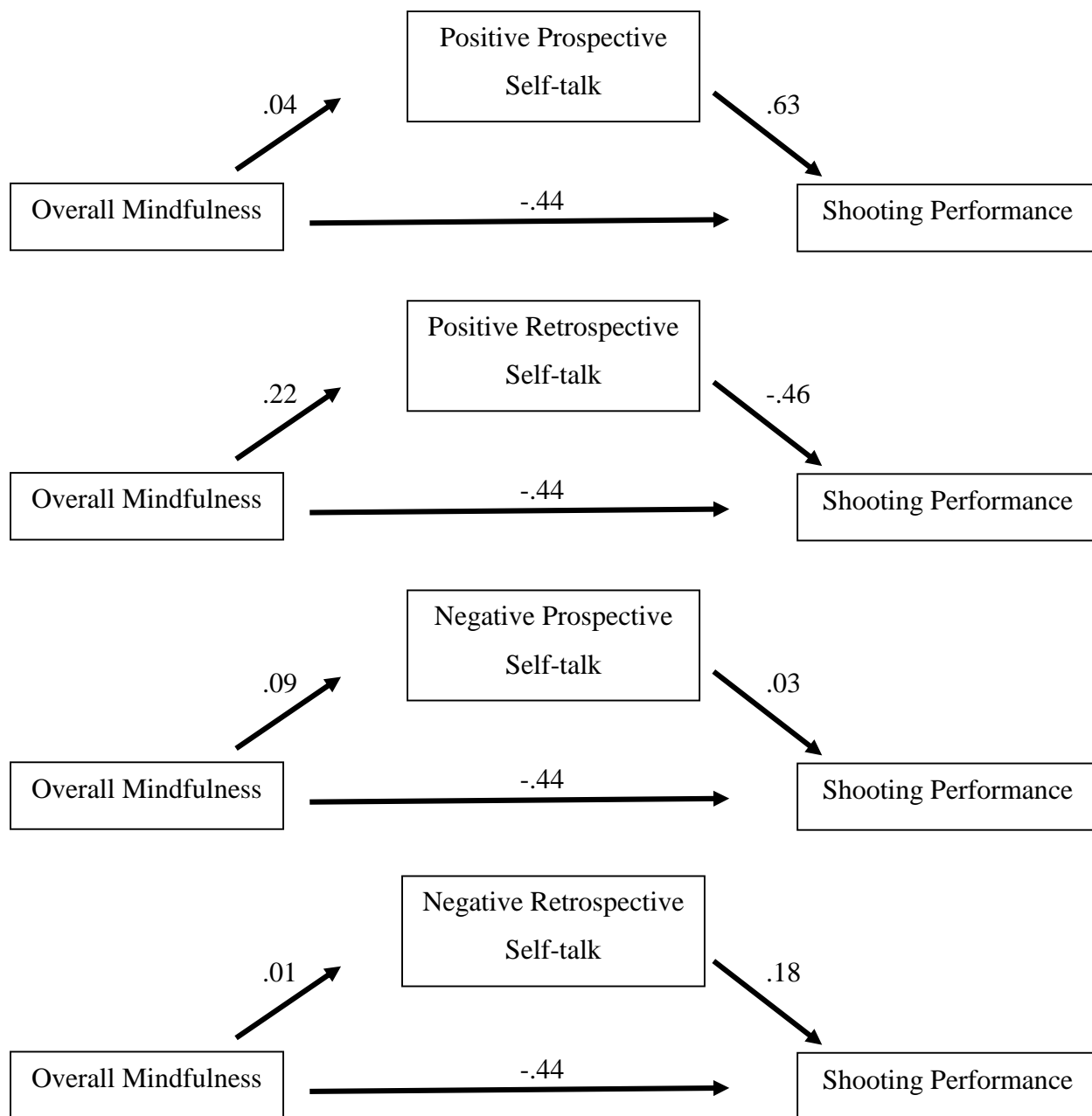
* $p \leq .05$

Figure 2. Standardized regression coefficients for the relationship between changes in overall mindfulness level and changes in shooting performance as mediated by the four types of spontaneous self-talk.

*p ≤ .05

from the mindfulness program evaluation questionnaire provided to the participants in the experimental group at the end of the experiment. Each of the five questions was evaluated independently, with a higher score indicating an increase positive opinion of that aspect of the intervention, up to a maximum score of 5. The results of this analysis indicated that the 11 athletes in the experimental group who completed that entire experiment had an overall positive opinion of the MMTS 2.0 program ($M = 20.73$, $SD = 2$). Further investigation found that the athletes strongly felt that the materials provided were helpful ($M = 4.55$, $SD = 0.52$), that they planned to continue to use the skills they learned in the future ($M = 4.36$, $SD = 0.5$), and that they were overall satisfied with the mindfulness program ($M = 4.36$, $SD = 0.5$). Furthermore, participants indicated overall agreement with the statement of being able to apply the skills and teachings from the program to their football experience ($M = 3.64$, $SD = 0.81$), and that they felt that the program had a positive impact on their performance ($M = 3.62$, $SD = 0.75$).

Discussion

In order to be able to discuss these results, it is important to first note the three overall purposes that the research was aimed at addressing. First, this study aimed to provide further evidence towards the existence of a positive relationship between mindfulness and sport performance that had generally been shown in previous research (Noetel et al., 2019). As a part of demonstrating this positive relationship, this study also aimed to provide more evidence towards the effectiveness of the Mindfulness Meditation Training for Sport (MMTS) 2.0 program, a recently developed mindfulness training program specifically designed towards use by elite athletes (Baltzell & Summers, 2017b). The second purpose for this study was to investigate the relationship between mindfulness and spontaneous self-talk, something that had previously been speculated on in the literature but had not been directly studied. The final

purpose of this study was to investigate the possibility of spontaneous self-talk mediating the positive relationship between mindfulness and performance, as the relationships between mindfulness, sport performance and other psychological performance surrogates is still unclear in the existing literature (Bühlmayer et al., 2017).

Looking at this aforementioned first purpose of the study, it was hypothesized that the experimental group would demonstrate a significant increase in mindfulness from the beginning of the MMTS 2.0 intervention to the end. It was further hypothesized that there would be an associated significantly greater increase in sport performance in the experimental group in comparison to a control over this period of time. However, the results of this study did not provide support for these hypotheses, as mindfulness was not shown to have increased significantly over time. As well, not only did performance on the shooting accuracy task not significantly increase for either group over time, there was not a significant difference in the amount of change between groups, and the amount of change in mindfulness was not significantly correlated with the amount of change in shooting performance as had been expected. These findings were not entirely consistent with the existing literature, as previous studies using the MMTS 2.0 program demonstrated increases in mindfulness (Baltzell & Akhtar, 2014), and mindfulness has generally shown to be positively correlated with increases in sport performance over time (Gardner & Moore, 2017; Noetel et al., 2019).

The second purpose of this study, to investigate the relationship between mindfulness and spontaneous self-talk was examined next. It had been hypothesized that increases in mindfulness would be positively associated with both positive prospective and retrospective self-talk, while being negatively correlated with negative prospective and retrospective self-talk. When looking only at the pre-intervention values, done in order to remove the effects of the MMTS 2.0

program on this association, several significant moderate positive correlations were found, between overall mindfulness and both positive prospective and retrospective self-talk, as well as between the subfactor of refocussing and both types of positive spontaneous self-talk. In addition, the non-judgemental aspect of mindfulness was moderately, though non-significantly, positively associated with negative prospective self-talk. Though little previous research had been done into this relationship, this result provides further support to the work done by Bervoets (2013) who had previously found evidence to suggest that moderate associations existed between both positive and negative automatic self-talk and mindfulness. As spontaneous self-talk developed out of the framework of automatic self-talk, it was expected that these relationships would carry over, and the results of this study provide some evidence in support of this idea.

Additionally, previous work had suggested both that increased mindfulness would lead to reductions in the amount of cognitive disruptions and task-irrelevant thoughts (Thompson et al., 2011), and that increased mindfulness would reduce the likelihood of increased negative affect in comparison to a control group (Baltzell & Akhtar, 2014). The results of this study provided minimal support for this hypothesis, as when looking at the amount of change all of the included mindfulness factors, as well as the overall mindfulness score were found to be non-significantly associated with any of the types of spontaneous self-talk. In addition, no significant differences in the amount of positive or negative prospective or retrospective self-talk were seen over time, and no differences in the quantity of any type of spontaneous self-talk were found between the experimental and control groups. However, some evidence for these proposed relationships was found, as while the results were not significant, there was still evidence of a moderate positive correlation between the changes in overall mindfulness and positive retrospective self-talk, as well as several other non-significant correlations approaching a moderate strength of association.

Overall, though these results provide limited support for the idea that increasing mindfulness will reduce negative spontaneous self-talk and increase positive spontaneous self-talk, the findings of several non-significant moderate and weak-to-moderate correlations may suggest that the relationships do exist, but this study lacked sufficient power to be able to detect the existing associations between factors. Future studies in this field should aim to address this lack of power when investigating this relationship.

The final purpose of this study was to investigate whether changes in spontaneous self-talk over the course of a mindfulness-based intervention (MBI) would mediate the expected relationship between mindfulness and sport performance. As no significant relationships were found between mindfulness, performance and self-talk, it was initially debated whether to continue with this analysis. Based on the work done by Fairchild and McDaniel (2017) and Shrout and Bolger (2002), the mediation analysis was completed in order to provide as much information as possible about the non-significant results found elsewhere in the analysis. This analysis found that there was no significant mediation effect of spontaneous self-talk on the mindfulness-performance relationship. In this line of thought, Noetel et al. (2019) had previously noted that there was an existing gap in the literature in which little to no research had investigated the mechanisms by which mindfulness influenced performance. The results of this mediation analysis do provide some evidence that spontaneous self-talk does not play a role in the process by which mindfulness influences sport performance. However, any conclusions that can be drawn from this evidence are in effect limited in that in this study mindfulness was not found to significantly influence performance, which was not consistent with previous research (e.g. Bühlmayer et al., 2017; Gardner & Moore, 2017), and as such the analysed mediator relationship may not have been representative of a wider effect outside of this study in particular.

The unexpected non-significant results found throughout this study may be due to several different limitations, from the study design itself to external limitations as a result of conducting the research during an ongoing global pandemic, and finally due to unexpected changes in the structure of the Glyfada Women's Football Club (Glyfada WFC), who were involved in the MMTS 2.0 program. First, the study had several factors in its design that may have affected the results of the program. For instance, to the researcher's knowledge the MMTS 2.0 program had never been provided in the Greek language previously, and as a result the translation may have introduced some unidentified issues with the intervention. In addition, although the researcher leading the intervention had personal meditation experience, they were not familiar with this program in specific prior to starting to work on this study, and as such may not have been able to provide the same level of instruction as someone formally trained in the MMTS 2.0 program. In addition, over the length of the intervention there was a notable attrition rate for participants in the experimental group, with 31.25% (5 of 16) of the starting group not participating the post-intervention assessments, which may have decreased power enough so that any effects present in this study were not detectable in our analyses. Finally, the lead researcher had previously introduced concepts of mindfulness and mindfulness meditation to several athletes in the control group; however, analyses indicated that there no significant pre-intervention differences on any of the mindfulness, self-talk, and performance assessments between the two groups, suggesting that any effects of this potential limitation were likely minimal.

Moving past the limitations present in the study design and implementation, it is important to note several issues that stemmed from the ongoing Covid-19 global pandemic. For instance, at the start of this intervention, Athens – where Glyfada WFC is located – had significant restrictions on the times during which anyone could be outside of their residences,

with further restrictions on the number of people who could be in the same space indoors at any one time. This led to all of the MMTS 2.0 sessions needing to be completed outdoors at the training facility, limiting the manner in which instruction could be delivered. Furthermore, due to the restrictions on time, there was little to no flexibility in scheduling the mindfulness training sessions which created scheduling conflicts, causing a few of the athletes who complete both assessments to miss several of the mindfulness intervention sessions. As well, towards the end of the intervention the Greek Government allowed youth academy teams to return to training, leading to significantly greater environmental distractions for the last 2 modules of the intervention compared to the initial 4 modules.

The last notable limitations for this study came directly from the Glyfada WFC who replaced their head coach midway through the experiment. This is important as after the coaching change the researcher who was providing the mindfulness training, as well as some of the Glyfada WFC athletes noted substantial negative changes in the team's overall motivation climate, which has been shown to impact athletes positive and negative self-talk (Zourbanos et al., 2016). In addition, as the initial head coach was the point of contact between the researchers and the club, this change in coaching created issues in communication, leading to training sessions (and therefore mindfulness sessions) being cancelled without notice, which in turn caused a one-week delay between modules 4 and 5 of the MMTS 2.0 program. Together, all of these limitations, whether from the design, global pandemic, or the team itself provide many different potential reasons why there were so many unexpected non-significant results in this study. However, many of these limitations can be easily controlled for in future research, such as through more pre-intervention training for the researcher, or a closer partnership with the football club involved to reduce the impact of mid-season changes. In addition, it is highly likely that in

future research many of the limitations that resulted from pandemic restrictions will no longer be present, and with these restrictions removed more flexibility will likely be available to account for some of the other issues identified.

However, though many unexpected and non-significant results have been briefly discussed, and many limitations identified that may explain these results, there is still some evidence to suggest that the mindfulness intervention may have been effective. At the end of the study, each athlete for Glyfada WFC completed a program evaluation as a part of their final assessments. The results of this evaluation indicated that although several potential limits existed in how the MMTS 2.0 intervention was delivered, overall, the athletes felt that their experience during the intervention was a positive one, finding the materials provided to assist in their learning helpful, and that they were generally able to apply what they learned to their football experience. Further to this, in contrast to the non-significant improvements in sport performance found in the analysis, the athletes indicated that they generally felt that the mindfulness training had a positive impact on their performance and that they planned to continued using the skills they gained in the future after the experiment was done. These findings were similar with the research done by DiBernardo (2018), who also found no significant quantitative results across several psychological performance variables, but found strong support for the intervention in qualitative interview data. As such, though there is a lack of evidence in this study to strongly support the efficacy of the MMTS 2.0 program on increasing mindfulness and subsequently increasing performance, the results of this experiment provide some evidence to suggest that the intervention had positive effects on the athlete's performance, though the effects may not have been detected in the current study.

In conclusion, this study investigated the relationships between mindfulness, spontaneous self-talk and sport performance in football (soccer). The results of this study did not find support for prior findings that increases in mindfulness would be positively related to increases in sport performance. In addition, this study did not find support for the proposed theoretical link between mindfulness and spontaneous self-talk in sport, nor did it find support for spontaneous self-talk serving as a mediating factor in the relationship between mindfulness and performance. Through athlete feedback, the study did find some support for the idea of a positive relationship existing between increased knowledge and skills in mindfulness and mindfulness and general sport performance. Furthermore, this study does provide some support for the use of the MMTS 2.0 intervention, as the athletes indicated that it had a general positive impact on their performance, and that the intervention was both a positive experience and provided them with skills they planned to continue using moving forwards. However, several limitations were identified from the design, general environment and from the football club itself that may have accounted for the lack of support found for our hypotheses. Future research investigating the relationships between mindfulness, psychological performance surrogates, and performance in team sports would benefit from accounting for these identified limitations. As well, future research that uses more complex assessment procedures will be needed to determine potential sources of the discrepancy between the lack of improvement in shooting accuracy task and athlete-reported positive changes in performance, as team sports like football consist of much more complex processes than just an individual physical skill that may be influenced by an athlete's mindfulness. Overall, this study was able to address its research questions, and has identified several different directions for future research, though the limitations discussed should be addressed in future study.

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Appendix A

Mindfulness Inventory for Sport

Οι παρακάτω δηλώσεις περιγράφουν πράγματα που οι αθλητές μπορεί να βιώνουν **κατά τη διάρκεια της αθλητικής προσπάθειας**. Παρακαλώ απαντήστε σε τι βαθμό οι δηλώσεις αυτές ισχύουν για τις πρόσφατες αθλητικές σας εμπειρίες σύμφωνα με την παρακάτω κλίμακα.

1 = "Δεν ισχύουν καθόλου",   6 = Ισχύουν πάρα πολύ"

Κατά τη διάρκεια της αθλητικής προσπάθειας/εκτέλεσης …

1. Συνειδητοποιώ τις σκέψεις που περνάνε από το μυαλό μου	1	2	3	4	5	6
2. Καταλαβαίνω την ένταση στο σώμα μου όταν νιώθω νευρικότητα	1	2	3	4	5	6
3. Καταλαβαίνω στο σώμα μου την αίσθηση που προκαλεί ο ενθουσιασμός	1	2	3	4	5	6
4. Καταλαβαίνω στο σώμα μου τη δυσφορία όταν τη βιώνω	1	2	3	4	5	6
5. Δίνω προσοχή στα συναισθήματα που νιώθω	1	2	3	4	5	6
6. Όταν καταλαβαίνω ότι σκέφτομαι για προηγούμενες αποδόσεις μου, κριτικάρω τον εαυτό μου που δεν εστιάζω σε αυτό που πρέπει να κάνω τώρα	1	2	3	4	5	6
7. Όταν καταλαβαίνω ότι θυμώνω για ένα λάθος που έκανα, κριτικάρω τον εαυτό μου για αυτή την αντίδραση	1	2	3	4	5	6
8. Όταν καταλαβαίνω ότι δεν εστιάζω στη δική μου απόδοσή, κριτικάρω τον εαυτό μου που η προσοχή μου αποσπάται	1	2	3	4	5	6
9. Όταν καταλαβαίνω ότι σκέφτομαι το τελικό αποτέλεσμα, κριτικάρω τον εαυτό μου που δεν εστιάζω στο παιχνίδι μου	1	2	3	4	5	6
10. Όταν καταλαβαίνω ότι εκνευρίζομαι επειδή χάνουμε, κριτικάρω τον εαυτό μου για αυτή την αντίδραση	1	2	3	4	5	6
11. Όταν καταλαβαίνω ότι κάποιοι μύες μου έχουν 'σφίξει' ή πονάνε, προσπαθώ άμεσα να τους χαλαρώσω	1	2	3	4	5	6
12. Όταν καταλαβαίνω ότι σκέφτομαι πόσο κουρασμένος είμαι, γρήγορα επαναφέρω την προσοχή μου σε αυτά που πρέπει να κάνω	1	2	3	4	5	6
13. Όταν καταλαβαίνω ότι ενθουσιάζομαι πολύ επειδή κερδίζουμε, εστιάζω την προσοχή μου σε αυτά που πρέπει να κάνω	1	2	3	4	5	6
14. Όταν καταλαβαίνω ότι έχω μεγάλη ένταση, μπορώ να επαναφέρω την προσοχή μου σε αυτά που πρέπει να κάνω	1	2	3	4	5	6
15. Όταν καταλαβαίνω ότι δεν εστιάζω στη δική μου απόδοση, μπορώ γρήγορα να συγκεντρώσω την προσοχή μου εκεί που πρέπει για να αποδώσω καλά	1	2	3	4	5	6

Appendix B

Spontaneous Self-talk Questionnaire

Αυτο-ομιλία είναι οτιδήποτε λένε οι αθλητές-τριες στον εαυτό τους κατά τη διάρκεια της προπόνησης ή του αγώνα, σιωπηρά ή φωναχτά, και μπορεί να συμβαίνει αυθόρμητα ή με πρόθεση προκειμένου να ενισχύσουν την απόδοση τους ή να επιτύχουν κάποιο στόχο τους.

Παρακάτω υπάρχει μια λίστα από διάφορες δηλώσεις που συνήθως οι αθλητές απευθύνουν στον εαυτό τους κατά την διάρκεια της **προπόνησης και του αγώνα**. Σας παρακαλώ να διαβάσετε κάθε δήλωση και να προσδιορίσετε **πόσο συχνά** είπατε την καθεμία στον εαυτό σας, **κατά τη διάρκεια της προπόνησης ή του αγώνα που μόλις πήρατε μέρος, με βάση την παρακάτω κλίμακα.**

0	1	2	3	4
Ποτέ	Σπάνια	Μερικές φορές	Συχνά	Πολύ συχνά

Υποδείξτε πόσο συχνά κατά τη διάρκεια του αγώνα/προπόνησης που μόλις ολοκληρώθηκε, **είχατε αυθόρμητες σκέψεις, δηλαδή σκέψεις που μας έρχονται στο μυαλό από μόνες τους**, σαν τις παρακάτω:	Ποτέ	Σπάνια	Μερικές φορές	Συχνά	Πολύ συχνά
1. Θα τα πάω καλά	0	1	2	3	4
2. Θα αποτύχω	0	1	2	3	4
3. Θα κερδίσω	0	1	2	3	4
4. Θέλω να τα παρατήσω	0	1	2	3	4
5. Μπορώ	0	1	2	3	4
6. Θέλω να σταματήσω	0	1	2	3	4
7. Σήμερα θα είναι η μέρα μου	0	1	2	3	4
8. Δεν αντέχω άλλο	0	1	2	3	4
9. Θα τα καταφέρω	0	1	2	3	4
10. Τι θα νομίζουν/πουν οι άλλοι για την κακή μου απόδοση	0	1	2	3	4
11. Τα πήγα καλά	0	1	2	3	4
12. Πάλι λάθος έκανα	0	1	2	3	4
13. Τα κατάφερα	0	1	2	3	4
14. Απέτυχα	0	1	2	3	4
15. Τέλεια	0	1	2	3	4
16. Έπρεπε να είμαι καλύτερος	0	1	2	3	4
17. Η προσπάθεια μου απέδωσε	0	1	2	3	4
18. Τα πήγα χάλια σήμερα	0	1	2	3	4
19. Έχω γίνει καλύτερος	0	1	2	3	4
20. Είμαι άχρηστος	0	1	2	3	4

Appendix C

Ερωτηματολόγιο Αξιολόγησης του Προγράμματος

Τις τελευταίες 7 εβδομάδες, πόσες φορές την εβδομάδα, κατά μέσο όρο, έκανες διαλογισμό;

Για τις ακόλουθες δηλώσεις, παρακαλώ σημειώστε σε τι βαθμό συμφωνείτε ή διαφωνείτε με κάθε δήλωση:

1. Το υλικό που μου δόθηκε κατά τη διάρκεια του προγράμματος ήταν βοηθητικό στο να κατανοήσω τις διάφορες ενότητες:

1	2	3	4	5
Διαφωνώ απολύτως	Διαφωνώ	Ούτε συμφωνώ ούτε διαφωνώ	Συμφωνώ	Συμφωνώ απολύτως

2. Ένιωσα ότι μπορούσα εύκολα να εφαρμόζω αυτά που μάθαινα στο πρόγραμμα, όσο έπαιζα ποδόσφαιρο.

1	2	3	4	5
Διαφωνώ απολύτως	Διαφωνώ	Ούτε συμφωνώ ούτε διαφωνώ	Συμφωνώ	Συμφωνώ απολύτως

3. Σκοπεύω να συνεχίσω να χρησιμοποιώ όσα έμαθα κατά τη διάρκεια του προγράμματος στο μέλλον.

1	2	3	4	5
Διαφωνώ απολύτως	Διαφωνώ	Ούτε συμφωνώ ούτε διαφωνώ	Συμφωνώ	Συμφωνώ απολύτως

4. Το πρόγραμμα διαλογισμού είχε θετική επίδραση στην απόδοση μου στο ποδόσφαιρο:

1	2	3	4	5
Διαφωνώ απολύτως	Διαφωνώ	Ούτε συμφωνώ ούτε διαφωνώ	Συμφωνώ	Συμφωνώ απολύτως

5. Συνολικά, νιώθω ικανοποιημένος/η με αυτό το πρόγραμμα διαλογισμού:

1	2	3	4	5
Διαφωνώ απολύτως	Διαφωνώ	Ούτε συμφωνώ ούτε διαφωνώ	Συμφωνώ	Συμφωνώ απολύτως