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Evaluation of Mindful Sport Performance Enhancement (MSPE): A New Approach to Promote Flow in Athletes

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The construct of mindfulness appears to be compatible with theories of flow and peak performance in sport. The present study assessed how Mindful Sport Performance Enhancement (MSPE), a new 4-week program, affected flow states, performance, and psychological characteristics of 11 archers and 21 golfers from the community. Participants completed trait measures of anxiety, perfectionism, thought disruption, confidence, mindfulness, and flow. They additionally provided data on their performances and state levels of mindfulness and flow. Analyses revealed that some significant changes in dimensions of the trait variables occurred during the training. Levels of state flow attained by the athletes also increased between the first and final sessions. The findings suggest that MSPE is a promising intervention to enhance flow, mindfulness, and aspects of sport confidence. An expanded workshop to allot more time for mindfulness practice is recommended for future studies.

Successful athletes often speak about periods of time in which they were able to achieve peak performance, a condition commonly referred to as *the zone*. Despite the regular use of this term in interviews and articles, an agreed-upon scientific definition for the zone remains elusive (Cooper, 1998). Among the various characteristics attributed to being in this state are a fusion of body and mind, a heightened sense of skill mastery, deep concentration, emotional buoyancy, increased self-confidence, a focus on the present, low self-consciousness, perceptions of effortlessness, feelings of relaxation, self-transcendence, and automaticity of performance (Cooper, 1998; Sugarman, 1998). Although some research indicates that reaching the zone may not be voluntary (Alessi, 1995; Ravizza, 1984), there is widespread use of visualization techniques, martial arts, and psychotherapy, as well as an abundance of books and articles, intended to help athletes achieve this state (Cooper, 1998).

Sport psychologists interested in further elucidating the nature of the zone have begun comparing this condition to the state of *flow*, which has been empirically defined over the last 30 years (Cooper, 1998; Young & Pain, 1999). Csikszentmihalyi (1990) described flow as a mindset that typically occurs when an individual perceives a balance between the challenges associated with a situation and his or

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her capabilities to meet those demands. This balance can promote flow qualities, including centering of attention, perceptions of control over actions and environment, lower self-consciousness, losing track of time, merging of action and awareness, and greater intrinsic satisfaction (Csikszentmihalyi, 1990; Stein, Kimiecik, Daniels, & Jackson, 1995). As with explanations of the zone, flow theory suggests that people in this state tend to interpret their situation as optimal (Csikszentmihalyi & LeFevre, 1989; Stein et al., 1995). Unlike the situation with the zone, however, sport psychologists now have an understanding of how flow relates to athletic performance, as well as the factors that can affect its occurrence.

Studies with athletes have delineated several characteristics of peak-performance moments. Relaxation, confidence, high energy, present-centered focus, extraordinary awareness, feeling in control, and detachment from distractions are among the major factors that have been identified (e.g., Cohn, 1991; Garfield & Bennett, 1984). Jackson (2000) indicated that such findings suggest the existence of a clear relationship between the mental characteristics associated with peak performance and Csikszentmihalyi's (1990) conceptualization of flow. Since flow entails optimal mental functioning, it is often when athletes are in a state of flow that they produce their best results (Jackson, 2000). Jackson and Roberts (1992) suggested support for the notion that flow is the process underlying peak performance.

Research has also suggested that certain factors can influence the experience of flow in sport and that a large percentage of elite and college athletes perceive flow as controllable (Jackson, 1995; Russell, 2001). Russell identified characteristics that could promote a state of flow. Among them were elevated confidence, maintaining constructive thoughts, appropriate focus, optimal precompetitive arousal, and high intrinsic motivation. Conversely, Jackson, Kimiecik, Ford, and Marsh (1998) demonstrated that anxiety and perceived athletic skill deficits can interfere with flow. Their analyses showed that it was the cognitive aspects of anxiety (concentration disruption and worry) that most prevented flow. Another factor that may disturb flow is perfectionism, which can at times undermine sport performance and foster dissatisfaction during competition (Flett & Hewitt, 2005).

Catley and Duda (1997) reported that the improved performance and enjoyment that are characteristic of flow states may be fostered through established sport intervention techniques like goal setting, thought stopping, imagery, and self-talk. Researchers (e.g., Johnson, Hrycaiko, Johnson, & Halas, 2004; Kornspan, Overby, & Lerner, 2004) have found at best inconsistent results for these approaches, yet many athletes, coaches, and sport psychologists use these techniques in an effort to minimize the impact of negative cognitions and improve athletic performance (Conroy & Metzler, 2004). A focus on controlling or eliminating maladaptive thoughts and emotions, however, may not be as beneficial as previously assumed, since it could paradoxically trigger a monitoring process that searches for negative or unwanted cognitions, bringing them to awareness (Purdon, 1999; Wegner, 1994). Such awareness may lead to self- and task-irrelevant focus, which can negatively impact performance (Gardner & Moore, 2004, 2006, 2007).

Furthermore, Moore (2003) noted that procedures like goal setting, imagery, and self-talk fail to meet the standards required for designation as efficacious interventions for the enhancement of sport performance and encouraged the development of alternative approaches. Gardner and Moore (2004) stated that one fresh approach could be a mindfulness-based program, which emphasizes nonjudgmen-

tal, present-moment awareness of both internal experiences and external stimuli, and thus appears to be more theoretically connected to conceptualizations of peak performance and flow than are traditional change-based cognitive-behavioral techniques. These authors proposed that the traditional, control-based approaches to sport performance enhancement may inadvertently result in excessively cognitive (verbal-semantic, self-focused) rather than meta-cognitive (in-the-moment, nonjudgmental) activity, impairing the ability to automatically engage previously developed athletic skills, to appropriately respond to environmental cues, and to maintain task-relevant focus. Although it has yet to be explored in a published study, Brehm (1998) has posited the notion that mindfulness may be an important first step toward achievement of the zone or flow.

Mindfulness has been described as paying attention on purpose, in the present moment, and without judgment (Kabat-Zinn, 1994). Using meta-analytic techniques, Baer (2003) evaluated the effectiveness of mindfulness training and found that it may help alleviate a variety of mental health problems and improve psychological functioning. For example, programs such as Kabat-Zinn's (1982, 1990) Mindfulness-based Stress Reduction (MBSR) and Segal, Williams, and Teasdale's (2002) Mindfulness-Based Cognitive Therapy (MBCT) have been shown to reduce pain, anxiety, and depression, among other conditions (e.g., Kabat-Zinn et al., 1992; Teasdale et al., 2000). There is ample literature supporting an inverse relationship between mindfulness and anxiety (Roemer et al., 2009), perfectionism (Argus & Thompson, 2008), and self-focused attention (Hindman et al., 2009), and strong interest in mindfulness as an effective treatment for reducing anxiety (Orsillo & Roemer, 2005).

Siegel (2007) noted findings that cultivating mindful awareness appears to increase the capacity to regulate emotion, to combat emotional dysfunction, to improve thinking patterns, and to reduce negative mindsets, as well as to enhance bodily functioning and to strengthen interpersonal relationships. He suggested that the general clinical benefit of mindfulness is that the acceptance of one's situation can alleviate the internal conflict that may emerge when expectations of how life should be fail to match how life actually is. Numerous meditation exercises are available to develop mindfulness skills, which emphasize the importance of observing, but not evaluating, phenomena entering awareness.

Although they have not often referred to it as "mindfulness," sport psychologists and coaches have recognized the importance of the concepts underlying this construct to athletic performance. For instance, in a book by Blythe (2006), Dean Smith and Mike Krzyzewski, two legendary basketball coaches, separately spoke of the importance of being in the present moment, focusing on process rather than outcome, and letting go of the uncontrollable, all of which are key aspects of mindfulness. In addition, Bob Rotella, a sport psychologist for golfers, has discussed the significance of letting go of memories of shots, staying in the present, accepting whatever happens without judgment, and looking for rhythm in the game (Rotella & Cullen, 2004), each of which is part of behaving mindfully. In reality, these tasks are often easier for athletes to conceptualize than accomplish, but mindfulness training could provide guidance in building the skills necessary to complete them.

While mindfulness practice has to date garnered limited attention in sport psychology research with the exception of a few research teams, the important role of task-relevant, in-the-moment focus during athletic activity has been demon-

strated. For instance, Klinger, Barta, and Glas (1981) found that struggles in game performance shifted the attentional focus of intercollegiate basketball players from appropriate external game-related cues to more self-judging future-oriented ones, potentially worsening performance. In perhaps the first application of mindfulness to sport, Kabat-Zinn, Beall, and Rippe (1985) reported the results of training the 1984 U.S. Olympic Men's Rowing Team in mindfulness. Many rowers who medaled felt the training had helped them to prepare and perform optimally. Further, extending earlier research that showed a significant connection between mindfulness and flow experiences in nonathlete performers (e.g., Wright, Sadlo, & Stew, 2006), Kee and Wang (2008) found that greater mindfulness in university athletes related to higher levels of the challenge-skill balance, merging of action and awareness, clear goals, concentration, and loss of self-consciousness aspects of dispositional flow.

The Mindfulness-Acceptance-Commitment (MAC) approach to sport performance enhancement was developed by Gardner and Moore (2004, 2006, 2007) and is an integration and adaptation of MBCT (Segal et al., 2002) and Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 1999) for use with athletes and other high-level performers. According to Gardner and Moore (2006), seven modules make up the MAC protocol: (a) psychoeducation, (b) mindfulness, (c) values identification, (d) acceptance, (e) commitment, (f) skill consolidation and poise, and (g) maintaining and enhancing MAC. MAC is conducted in these seven modules (each of which could last for one or more sessions to achieve the goals of the module). The manualized MAC protocol has garnered initial empirical evidence for its efficacy in enhancing performance. Wolanin (2005) investigated the efficacy of this approach with college athletes and found (see Gardner & Moore, 2006; Wolanin, 2005) a small overall treatment effect when comparing performance ratings for a MAC treatment (37% had increased ratings) and a control group (14% had increased ratings) that included participants both with and without subclinical psychological difficulties, and a large treatment effect for those who had no subclinical psychological difficulties. As such, the data offered support for this approach as a performance enhancement intervention for psychologically healthy collegiate athletes. As indicated by Gardner and Moore (2007), Lutkenhouse, Gardner, and Moore (2007) conducted a larger trial with collegiate athletes, which was both randomized and controlled, and found that a significantly greater number of athletes completing MAC treatment (32% versus 10% of athletes receiving a traditional psychological skills training protocol) demonstrated a clinically significant increase in coach ratings of performance at posttest.

The present study was an attempt to explore how a new mental training approach, Mindful Sport Performance Enhancement (MSPE), could impact flow states, as well as athletic performance and the psychological factors thought to influence it. MSPE is conceptualized as a way of extending MBSR and MBCT to athletes, drawing on exercises in those approaches that target the cultivation of mindfulness (e.g., sitting meditation, body scan, mindful yoga, walking meditation) and adding a walking meditation adapted to be specific to fundamental movements involved in the sport of focus. Like MAC, MSPE emphasizes the development of mindfulness skills and through them, a degree of acceptance. Unlike MAC, MSPE does not include a focus on values, value-driven behavior, or commitment.

Athletes involved in self-paced, closed-skill, objectively scored sports requiring significant mental focus and fine motor movements, such as archery and golf, were

thought to benefit most from MSPE training and were thus chosen for this study. It was hypothesized that archers and golfers who participated in a MSPE workshop would experience reductions in sport anxiety, perfectionism, and thought disruption, as well as growth in sport confidence. Furthermore, it was predicted that these athletes would become more mindful, display greater elevations in performance, and be more likely to enter flow while participating in their sport. Finally, anxiety, perfectionism, and thought disruption were expected to be inversely related to flow, while confidence and mindfulness were expected to relate positively to flow.

Method

Participants

A total of 32 recreational athletes who practice and compete at community facilities in the Washington, DC metropolitan area registered for the MSPE workshops. Of these athletes, 11 (34.4%) were archers and 21 (65.6%) were golfers. In addition, 23 (71.9%) of the participants were men and 9 (28.1%) were women. The sample was predominantly Caucasian (90.6%), but also included one African American (3.1%), one Asian/Pacific Islander (3.1%), and one Hispanic/Latino (3.1%). Participant ages ranged from 18 to 76 years old (M = 52.19). Three of the workshop registrants (1 archer and 2 golfers) dropped out before the first session. The mean number of weekly sessions attended by the remaining 29 registrants was 2.97, with 4 (13.8%) athletes attending one session, 4 (13.8%) attending two sessions, 10 (34.5%) attending three sessions, and 11 (37.9%) attending all four sessions.

Before beginning MSPE, 18 (56.3%) of the athletes reported that they had previous exposure to sport psychology, and 15 (46.9%) indicated that they had practiced meditation, yoga, or similar contemplative activities. The length of time that the athletes had participated in their respective sport ranged from 1 to 50 years (M = 17.44), and the number of times they reported participating in their sport during an average month ranged from 1 to 28 times (M = 9.19). Before starting the MSPE training, the number of archery tournaments these athletes had participated in during the last 2 years ranged from 0 to 50 (M = 13.82). The golfers' preworkshop handicap scores ranged from 0 to 36 (M = 15.81).

Procedure

Archer Recruitment. Target archers (recurve, traditional, and compound) in the mid-Atlantic region were recruited from clubs and teams, lists of participants in recent competitions, and by posting flyers at archery shops and tournaments. Each announcement made invited athletes to a free, 4-week mental training workshop in mindfulness meditation designed to improve archery performance. Random assignment to an experimental or wait-list control group, as originally planned, was not possible because too few archers registered. Thus, one workshop for archers was run in the spring, a time thought to be convenient for their shooting schedules.

Golfer Recruitment. Golfers of all skill levels were recruited from the mid-Atlantic region by posting flyers in golf course pro shops and on message boards in area businesses, advertising on golf association websites and in major newspapers, as well as by emailing local college golf coaches. Despite initial

intentions, random assignment of the golfers to an experimental or wait-list control group was not possible, due to the various scheduling requests made at registration. Thus, most golfers were allowed to choose between the two summer MSPE workshops offered, and the four golfers without scheduling constraints were randomly assigned.

Baseline, State, and Post-Workshop Assessment. When athletes replied with interest in the training, they were sent an e-mail providing additional details about the workshop times, as well as a registration packet. This packet contained two copies of an informed consent form, a cover letter delineating the rationale of the mindfulness program, and a workshop registration form, along with questionnaires assessing their relevant backgrounds and trait levels of sport anxiety, perfectionism, sport confidence, thought disruption, mindfulness, and flow. Two versions of the packet were used, differing only in the sequential positioning of the trait measures. The athletes were asked to return completed packets in a preaddressed, stamped envelope that was provided.

When the athletes arrived during the first week, the rationale of the workshop was explained in greater detail, and they then filled out a questionnaire assessing their perceptions of the workshop's credibility and their outcome expectations. Following the first session, they completed a state measure of mindfulness while still on site. This state mindfulness measure was readministered at the conclusion of every workshop session.

Between sessions, the athletes were asked to practice the mindfulness skills they had been taught (see below for a description of these skills) and to monitor their progress in a daily mindfulness log. In addition, they were asked to compete in their sport or keep score during practice at least once per week, and to record their results in a daily sport performance log. Specific instructions were provided to the athletes on how to fill out both logs. Immediately following all competitions or scored practices, the athletes were asked to complete a state measure of flow.

At the end of the last workshop session, the athletes filled out the same measures they had at registration (except the background questionnaire), with the addition of an exit survey. Final sets of mindfulness logs, sport performance logs, and state flow measures were distributed, along with a preaddressed, stamped envelope in which to return them. These materials were mailed to those participants who were absent during the final session.

Mindfulness Training

A treatment manual for MSPE was developed for the current study, which integrates and adapts elements of Kabat-Zinn's (1982, 1990) Mindfulness-based Stress Reduction and Segal et al.'s (2002) Mindfulness-based Cognitive Therapy. Among the many other sources of information that helped shape the MSPE manual were (a) the authors of the first reported effort to train athletes in mindfulness (B. Beall, personal communication, March 7, 2006; Kabat-Zinn et al., 1985); (b) additional experts on mindfulness (K. Brandt, personal communication, April 18, 2006; Z. Segal, personal communication, April 10, 2006); (c) a renowned archery coach in the mid-Atlantic region (J. Body, personal communication, February 13, 2006); and (d) various books on the psychology of archery (Herrigel, 1953; Lee & de Bondt, 2005), golf (Rotella & Cullen, 2004), and other highly mental sports like tennis (Gallwey,

1974). The introductory session of MSPE provides a sport-specific rationale for the use of mindfulness in athletics, and each session of the training contains exercises that are key elements of Kabat-Zinn and Segal et al.'s mindfulness programs, such as the raisin exercise, the body scan, mindful breathing, the sitting meditation, mindful yoga, and the walking meditation. MSPE additionally includes a unique component, which is a walking meditation modified to be specific to the sport of focus. See the Appendix for a summary outline of the MSPE treatment protocol.

Although Kabat-Zinn and Segal et al.'s programs are 8 weeks long, concerns about asking for that level of commitment from busy people who were neither elite athletes highly invested in performance enhancement nor seeking treatment for a debilitating physical or psychological problem led to a decision to make MSPE a 4-week program with slightly longer (2.5–3 hr) sessions. There is precedent for using a brief mindfulness intervention successfully; for example, nurses and nurse aides who received four 30-min group mindfulness sessions experienced significant improvements in burnout symptoms, relaxation, and life satisfaction (Mackenzie, Poulin, & Seidman-Carlson, 2006). In addition, Jain et al. (2007) reported that a one-month mindfulness meditation training program reduced distress and improved positive mood states in students when compared with a control group.

Measures

Background Questionnaire. Two versions of this 12-item measure were designed for the current study, one specific to archers and one to golfers. All athletes report their gender, age, ethnic background, the nature of any sport psychological or meditation experiences they have had, their best athletic performance scores (both lifetime and within the last 12 months), how long they have participated in their sport, and frequency of current participation in their sport.

Sport Anxiety Scale (SAS). The SAS (Smith, Smoll, & Schutz, 1990) is a 21-item self-report measure of cognitive and somatic trait sport anxiety, with each item rated on a 4-point, Likert-type scale ranging from 1 (*not at all*) to 4 (*very much so*). This instrument contains three subscales assessing somatic anxiety, worry, and concentration disruption. Support for the internal consistency, test-retest reliability, convergent validity, and construct validity of the SAS have been found (Smith et al., 1990). As recommended by Smith, Cumming, and Smoll (2006), three items were not included in the scoring to maximize the SAS's factorial integrity.

Multidimensional Perfectionism Scale (MPS). The MPS (Frost, Marten, Lahart, & Rosenblate, 1990) has 35 items, each of which is rated on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*), and contains six subscales: concern over mistakes, personal standards, parental expectations, parental criticism, doubts about actions, and organization. It has been found to have excellent internal consistency, and to correlate highly with other perfectionism measures (Antony, Orsillo, & Roemer, 2001; Frost et al., 1990). To date, perfectionism in sport has been measured almost exclusively by this measure (Gotwals, Dunn, & Wayment, 2003).

Carolina Sport Confidence Inventory (CSCI). The CSCI (Manzo, Silva, & Mink, 2001) is a 13-item self-report instrument designed to assess sport confidence. After deciding which of two listed statements best describes them, respondents

select whether the statement is *somewhat true for me* or *very true for me*. The CSCI contains two subscales: dispositional optimism and sport competence. Support for the internal consistency, convergent validity, and test-retest reliability of the CSCI have been found (Manzo et al., 2001). For the current study, items on this instrument were modified slightly to create versions specific to the sports of golf and archery.

Thought Occurrence Questionnaire for Sport (TOQS). The TOQS (Hatzigeorgiadis & Biddle, 2000) assesses the cognitive interference or thought disruption that athletes may experience during competition. It contains 17 items, each of which is rated on a scale from 1 (*almost never*) to 7 (*very often*). This measure includes three subscales: task-related worries, task-irrelevant thoughts, and thoughts of escape. Analyses have suggested that the TOQS has adequate convergent validity, concurrent validity, discriminate validity, and internal consistency (Hatzigeorgiadis & Biddle, 2000). In the current study, the TOQS instructions were modified slightly to refer specifically to thoughts during a typical competition in either archery or golf.

Kentucky Inventory of Mindfulness Skills (KIMS). The KIMS (Baer, Smith, & Allen, 2004) is designed to assess the tendency to be mindful in daily life, with the 39 items rated from 1 (*never or very rarely true*) to 5 (*very often or always true*). It has four subscales: observing, describing, acting with awareness, and accepting without judgment and has been shown to have internal consistency, test-retest reliability, and content validity (Baer et al., 2004).

Dispositional Flow Scale-2 (DFS-2). The DFS-2 (Jackson & Eklund, 2002) is a measure of the tendency to experience flow during a physical activity, with each of the 36 items rated on a scale from 1 (*never*) to 5 (*always*). This scale is theoretically grounded in Csikszentmihalyi's (1990) concept of flow and contains nine subscales: challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, time transformation, and autotelic experience. Analyses of the DFS-2 have indicated that it is a reliable and valid measure of the flow construct (Jackson & Eklund, 2004). In this study, the DFS-2 instructions were changed slightly to make it clear that it was asking archers and golfers about experiences in their respective sport.

Credibility and Expectations Measure (CEM). The CEM was developed for this study to assess the perceived credibility of the workshop and expectations of performance improvement following the training. It was adapted from the Reaction to Treatment Questionnaire (RTQ; Holt & Heimberg, 1990), which itself was adapted from work by Borkovec and Nau (1972). The CEM has eight items, each of which is rated on a 10-point, Likert-type scale. Two CEM versions were created, one worded for archers and one for golfers.

Toronto Mindfulness Scale (TMS). The TMS (Lau et al., 2006) assesses state levels of mindfulness immediately following the practice of a mindfulness exercise (Bishop et al., 2004). Each of the 13 items is rated on a scale ranging from 0 (*not at all*) to 4 (*very much*). Analyses by Lau et al. showed that this instrument is a reliable and valid measure of state mindfulness, and that it contains two subscales: curiosity and decentering.

Daily Mindfulness Log. Adapted from Segal et al.'s (2002) Homework Record Form, this measure asks participants to keep a daily account of whether they practiced mindfulness skills and the length of their practice, as well as any observations they note.

Daily Sport Performance Log. Created for this study, this log asks participants for data on their sport performances that occur between workshop sessions, including the nature of their athletic activities (practice/friendly or competition), the scores they obtain, and their satisfaction with their scores. Two versions were developed, one worded for archers and one for golfers.

Flow State Scale-2 (FSS-2). The FSS-2 (Jackson & Eklund, 2002) is designed to assess flow experiences during a recently completed physical activity. The items are identical to those on the DFS-2, but are worded in the past tense, and investigations have suggested that it is a reliable and valid measure of Csikszentmihalyi's flow construct (Jackson & Eklund, 2004).

Exit Questionnaire (EXT). Created for this study, the 14-item EXT asks participants to report their reactions to and experiences during the workshop. The first 8 items are similar to those on the CEM but reworded to assess reactions. The final 6 items ask for open-ended responses regarding what participants liked most, what was most challenging, how performance in their sport was affected, how much they expect the training to affect their future performance, how nonsport aspects of their lives have been affected, and recommendations for improvements to the workshop. A coding manual was developed for the scoring of these open-ended items, and raters trained until they achieved a kappa of .80. Kappa values for the coded items ranged from .37–1.00. Two EXT versions were created, one worded for archers and one for golfers.

Results

Baseline Differences between Athlete Groups

Independent samples *t* tests were used to determine whether the archers differed from the golfers in age, number of years playing their sport of concentration, and frequency of meditation per week, as well as on trait measures of anxiety, perfectionism, confidence, thought disruption, mindfulness, and flow before attending the MSPE workshop. No significant preworkshop differences were found between these groups at the time they registered for the training. In addition, chi-square analyses revealed no differences between the athlete groups in gender or ethnicity.

Changes From Pre- to Postworkshop

Trait Variables. Matched-samples *t* tests were used to examine how the trait psychological variables measured at baseline had changed following the 4-week MSPE workshop (see Table 1). As predicted, the archers' overall trait mindfulness and dispositional optimism (an aspect of sport confidence) significantly increased over this time, along with parental expectations (an aspect of perfectionism). The golfers' ability to describe observed phenomena (an aspect of mindfulness) increased significantly from baseline to postworkshop, as expected. No other components of the trait psychological variables changed significantly from pre- to postworkshop for either the archers or golfers.

Table 1 Pre- and Postworkshop Means and *t*-tests for Trait Psychological Variables

	Archers			Golfers		
Trait Measure	**Pre**	**Post**	***t***	**Pre**	**Post**	***t***
Sport Anxiety	35.00	33.60	-.60	35.43	37.29	.82
Somatic anxiety	12.17	10.67	-2.42^{+}	13.93	15.36	1.34
Worry	16.86	15.00	-1.01	15.71	15.29	-.34
Concentration cisruption	6.20	6.20	.00	5.79	6.64	1.99^{+}
Perfectionism	80.14	84.29	1.52	76.57	77.64	.39
Concern over mistakes	22.14	22.14	.00	20.21	20.71	.43
Personal standards	23.86	24.43	.60	24.50	25.21	.65
Parental expectations	13.14	15.71	2.96*	13.57	13.93	.43
Parental criticism	9.14	10.14	1.18	9.43	8.57	-1.33
Doubts about actions	11.86	11.86	.00	8.86	9.21	.38
Organization	19.29	20.00	.96	22.79	23.43	1.88^{+}
Thought Disruption	49.71	46.71	-2.17^{+}	54.64	53.00	-.44
Task-related worries	23.71	21.29	-1.59	22.29	21.21	-.57
Task-irrelevant thoughts	17.43	15.86	-.91	17.93	17.79	-.10
Thoughts of escape	8.57	9.57	1.05	14.43	14.00	-.34
Sport Confidence	34.50	37.50	2.48^{+}	35.93	36.50	.60
Sport competence	15.17	16.33	1.47	15.64	15.93	.51
Dispositional optimism	19.43	21.14	3.29*	20.29	20.57	.59
Mindfulness	129.71	138.57	3.62**	127.57	127.29	-.13
Observe	41.71	41.71	.00	38.93	37.93	-1.16
Describe	28.86	32.29	1.36	28.93	31.07	2.54*
Act with awareness	31.14	33.57	1.48	30.07	29.21	-1.64
Accept without judgment	28.00	31.00	2.17^{+}	29.64	29.07	-.47
Flow	130.57	133.14	.73	122.79	127.14	.86
Challenge-skill balance	12.29	13.86	1.51	13.79	13.93	.25
Merge action and awareness	13.14	14.43	1.89	12.50	12.50	.00
Clear goals	16.29	17.71	2.20	15.86	16.36	.86
Unambiguous feedback	16.86	16.43	-.66	15.93	16.57	.78
Concentrate on task at hand	14.14	14.71	.62	13.07	13.43	.56
Sense of control	14.00	13.71	-.37	12.93	13.14	.23
Loss of self-consciousness	15.00	14.71	-.15	12.36	14.14	1.90^{+}
Transformation of time	13.00	10.71	-1.60	10.86	11.36	.46
Autotelic experience	15.86	16.86	1.87	15.50	15.71	.23

Note. For these analyses, archer $n = 7$ and golfer $n = 14$.

$^{+}p < .10$. $*p < .05$. $**p < .01$.

Sport Performance. Examination of how archery performance changed over the course of the 4-week MSPE workshop unfortunately was not possible. Scores were not comparable within or between archers because they varied weekly according to the type of archery, the number of arrows shot, the target distance, and the target size.

With regard to golf performance, a mean 18-hole score was computed for individual golfers for each week of the training. A repeated-measures ANOVA analysis was not significant, but only three golfers reported at least one score for all 4 weeks of the workshop. In addition, matched samples *t* tests done between the best 18-hole score that the golfers reported for the year before the workshop and the best 18-hole score they recorded during the fourth week of their sport performance log (or the last week for which they submitted data) were not significant.

The athletes' opinions regarding what performance changes occurred and what performance changes they expected to take place in the future were also of interest. For the archers and golfers combined, the mean rating for the EXT item asking how successful the workshop was at improving the athletes' sport performance was 6.62 (on a 1–10 scale), and the mean ratings for the items asking how satisfied the athletes were with their performance following MSPE and expected to be in 1 year and 5 years were 7.00, 8.48, and 9.00, respectively. A matched samples *t* test revealed that the athletes' general level of satisfaction with their sport performance was significantly higher after the workshop than it was at the start, $t = 3.24$, $p < .01$.

Furthermore, frequencies were tallied based on the coded content of the open-ended items on the EXT. Approximately three-quarters (76.2%) of the athletes who completed this measure gave responses indicating that they expected MSPE would improve their performance quality and/or enjoyment in their sport in the future ($K = 1.0$), and one-third (33.3%) of responses to the question asking how MSPE has affected the athletes' sport performance were classified as indicating improved focus on the task at hand ($K = 0.83$).

State Variables. To evaluate whether the level of state mindfulness achieved during the workshop sessions changed over the course of the training, repeated-measures ANOVAs were used (see Table 2). For the five archers who completed the state mindfulness measure all 4 weeks, changes in both overall state mindfulness and the curiosity aspect of state mindfulness were nonsignificant, and matched samples *t* tests comparing the first and fourth workshop sessions revealed that neither scale increased significantly. As expected, the six golfers included in these analyses experienced a significant change in the decentering aspect of state mindfulness, with a matched samples *t* test comparing the first and fourth sessions indicating a significant increase in this factor.

Repeated-measures ANOVAs were also used to determine whether state levels of flow experienced during sport performance changed over the course of MSPE (see Table 2). Average state flow scores were computed for each participant for each week. Six of the athletes (two archers and four golfers) completed at least one state flow measure during each week of the training, so the sports were combined for these analyses. Significant change occurred in overall state flow and the unambiguous feedback subscale, with matched samples *t* tests comparing the first and fourth workshop sessions indicating a significant increase in unambiguous feedback.

Table 2 Means and ANOVAs for State Psychological Variables

State Measures	Week 1	Week 2	Week 3	Week 4	*F*
Mindfulness (all athletes)	27.18	26.55	28.55	31.00	2.22
Curiosity	13.09	10.55	11.18	11.91	1.64
Decentering	14.09	16.00	17.36	19.09	4.27*
Mindfulness (archers only)	32.20	29.00	30.40	34.60	3.27+
Curiosity	14.80	11.20	13.60	15.40	3.16+
Decentering	17.40	17.80	16.80	19.20	.61
Mindfulness (folfers only)	23.00	24.50	27.00	28.00	1.12
Curiosity	11.67	10.00	9.17	9.00	.99
Decentering	11.33	14.50	17.83	19.00	6.71*
Flow (all athletes)[a]	118.00	126.67	138.00	142.17	3.64*
Challenge-skill balance	12.83	14.67	15.50	15.33	2.27
Merge action and awareness	11.67	11.67	12.50	13.83	2.16
Clear goals	16.33	16.83	18.17	18.50	2.88+
Unambiguous feedback	14.67	16.83	17.83	18.17	4.93*
Concentrate on task at hand	11.67	12.17	14.17	14.67	1.11
Sense of control	12.50	12.50	14.50	15.50	1.97
Loss of self-consciousness	16.33	18.33	18.50	18.50	.89
Transformation of time	8.33	10.67	11.00	12.17	2.84+
Autotelic experience	14.00	13.50	16.00	16.00	.98

Note. Means are for athletes who completed the measure at least once *each* week of the workshop. For the mindfulness measure, all athletes $n = 11$, archers $n = 5$, and golfers $n = 6$. For the flow measure, all athletes $n = 6$ (2 archers and 4 golfers).

[a]Mean flow state score used (total and subscales) if measure filled out more than once during the week.

+$p < .10$. *$p < .05$.

Relationships Between Flow and Trait Variables

Pearson correlations were used to investigate preworkshop relationships for all athletes between dispositional flow and the other trait variables assessed in this study (see Table 3), and initial predictions about these relationships were strongly supported. Sport anxiety had a significant negative relationship with overall flow and every dimension of flow except for transformation of time and unambiguous feedback. Perfectionism and thought disruption had significant negative relationships with overall flow and every flow dimension except for transformation of time. Confidence had a significant positive relationship with overall flow and all dimensions of flow except for loss of self-consciousness and transformation of time. Mindfulness had a significant positive relationship with overall flow and every flow dimension except for transformation of time.

Postworkshop relationships between dispositional mindfulness and dispositional flow dimensions were also examined using Pearson correlations. Mindfulness continued to have a significant positive relationship with overall flow ($r = .67$, $p < .01$), as well as with the challenge-skill balance ($r = .57$, $p < .01$), merging of

Table 3 Preworkshop Correlations Between Dispositional Flow and Other Trait Measures

	Anxiety	Perfectionism	Thought Disruption	Confidence	Mindfulness
Total Flow	–.72***	–.75***	–.73***	.72***	.79***
Challenge-skill balance	–.54**	–.54***	–.56***	.77***	.61***
Merge action and awareness	–.46**	–.57***	–.43*	.52**	.46**
Clear goals	–.57***	–.64***	–.49**	.55***	.62***
Unambiguous feedback	–.35^{+}	–.61***	–.46**	.48**	.61***
Concentrate on task at hand	–.49**	–.50**	–.67***	.51**	.72***
Sense of control	–.72***	–.72***	–.62***	.77***	.65***
Loss of self-consciousness	–.50**	–.44**	–.41*	.33^{+}	.53**
Transformation of time	–.27	–.05	–.28	–.08	.17
Autotelic experience	–.67***	–.74***	–.69***	.75***	.63***

Note. Correlations based on total scores for measures of sport anxiety, perfectionism, thought disruption, sport confidence, and mindfulness. All workshop registrants (archers and golfers) included in these analyses, $n = 32$.

$^{+}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

action and awareness ($r = .61$, $p < .01$), clear goals, ($r = .49$, $p < .05$), loss of self-consciousness ($r = .49$, $p < .05$), and autotelic experience ($r = .48$, $p < .05$) flow dimensions.

Discussion

The present investigation assessed how a new brief mental training approach, Mindful Sport Performance Enhancement (MSPE), affected the athletic performance and certain performance-related psychological characteristics of archers and golfers. These types of athletes were chosen due to the hypothesis that self-paced, closed-skill, objectively scored sports requiring a high degree of mental focus and fine motor movement would allow for an optimal analysis of the efficacy of MSPE. Overall, the results suggest that MSPE has promise as an intervention for use with athletesto enhance flow, mindfulness, and aspects of sport confidence.

The finding that may have the most substantial implications for the role of MSPE is that the level of state flow achieved by the athletes during their weekly performances changed significantly over the course of the training. Specifically, there were significant changes in the level of overall state flow and the unambiguous feedback (i.e., clarity regarding ongoing evaluation of performance) aspect of flow. In each of these cases, there was an increase from week to week. Evidence that MSPE can affect state flow levels is important in performance-enhancement research, since flow has been linked to the zone and peak performance (e.g., Jackson, 2000; Jackson & Roberts, 1992).

Missing data excluded a number of the participants from these analyses, so it is possible that those athletes who consistently filled out the state flow measure differed from the rest in terms of their motivation, commitment, or other factors that could have influenced the findings. It is also interesting, however, that some significant results were found with such a small number of participants, suggesting that, with a larger sample, some of these findings could possibly have been stronger.

It seems logical to speculate that the brevity of MSPE could help account for why there were significant changes in dimensions of state, but not trait flow. Jackson and Eklund (2002) differentiated their state from their trait measure of flow by indicating that the state measure assesses flow experiences within a particular event, while the trait measure assesses the autotelic personality style or how psychologically equipped one generally is to experience flow. Certainly it would take longer for a personality change to occur than a change during an athletic event.

Although the current study revealed no significant findings regarding changes in trait flow, it extends the line of research exploring whether certain psychological factors are related to the occurrence of flow in sport (e.g., Jackson et al., 1998; Kee & Wang, 2008; Russell, 2001). Support was found for the hypothesized pre-workshop relationships between dispositional flow and the other trait variables, with flow relating negatively to anxiety, perfectionism, and thought disruption, and positively to confidence and mindfulness. The strong positive relationship between flow and mindfulness observed in this study and by Kee and Wang (2008) has exciting implications for the use of mindfulness-based interventions. Theoretical parallels between these constructs are clear. Kabat-Zinn (1994) suggested that mindfulness meditation is synonymous with the practice of nondoing, which is a kind of effortless effort. It is this concept of effortless effort that seems to lie at the

heart of conceptualizations of flow, peak performance, and the zone. For instance, Csikszentmihalyi (1997) described flow as reflecting the sense of effortless action felt during life's best moments.

In addition to flow, changes in mindfulness were also analyzed. There was significant change in the golfers' levels of the decentering aspect of state mindfulness, which reflects awareness of experience with some distance, as opposed to being carried away by thoughts and feelings (Lau et al., 2006). Decentering increased from session to session, and a comparison of the first and fourth sessions revealed significantly higher decentering levels at the training's end. Rotella and Cullen (2004) suggested that if emotions such as anger overwhelm golfers, they can lose their judgment regarding strategy and can compound an initial error with subsequent errors until their round is ruined, highlighting the potential importance of decentering to performance.

The archers experienced a trend toward significant change in their levels of overall state mindfulness and the curiosity component of mindfulness. Missing data and the brevity of training may partially account for the failure to find more significant change in levels of state mindfulness. Segal et al. (2002) described the importance of patience when learning mindfulness, indicating that the effects may only become visible over time. They compared the process to gardening, in that the ground must be prepared, the seeds must be planted, and nourishing must occur while waiting for tangible results.

There were also some significant changes in dimensions of dispositional mindfulness. The archers experienced a significant increase in overall trait mindfulness. The golfers, on the other hand, showed a significant increase in the describing aspect of trait mindfulness. In other words, the golfers improved their ability to covertly label and note present-moment observations (Baer et al., 2004).

It is interesting that significant change occurred for these athletes during this brief training in dimensions of dispositional mindfulness but not in dispositional flow, especially given the strong positive relationship between these constructs. The strength of this relationship was slightly less at postworkshop, possibly because there was significant change in one construct and not the other. One potential explanation for why change occurred in dispositional mindfulness but not dispositional flow is that MSPE specifically taught participants exercises to build mindfulness skills, rather than flow skills, and, although the correlation between these constructs is high, their relationship is not perfect. One should also consider that the demand characteristic of wanting to answer questions correctly after completing a mindfulness training program might have led to a change in mindfulness scores, while since flow was not directly trained, flow scores did not significantly change. This possibility calls into question whether real change in mindfulness occurred, since it would be expected that mindfulness and flow should change simultaneously. It is also possible that a change in mindfulness would precede a change in flow, which would not be observed until a later point in time.

Future studies should investigate the differences between mindfulness and flow in more detail. For example, the current study suggests that the transformation of time flow dimension may not relate significantly to trait mindfulness, with other aspects of flow relating significantly but to varying degrees. In addition, future work should explore in more depth whether changes in mindfulness mediate changes in flow during interventions for athletes. If so, it could be hypothesized

that, by lengthening the MSPE protocol or with continued practice of mindfulness skills, athletes would demonstrate significant change in dispositional flow in time. Future research should also consider assessing dispositional mindfulness and flow at midtraining, to help further address the question of mediation.

Significant change occurred in some of the other trait psychological factors, but not all of these changes were in the expected direction. Interestingly, in terms of the dispositional variables, what changed for the archers was not the same as what changed for the golfers, but the two athlete types did not differ significantly on the trait measures or in relevant background characteristics at baseline. Perhaps certain fundamental differences between their sports or the fact that they received the training separately at disparate venues can explain why the archers and golfers had dissimilar responses to the MSPE training.

Unexpectedly, both the archers and the golfers generally appeared to become more perfectionistic following MSPE. The only significant change involving aspects of perfectionism, however, was that the parental expectations scores of the archers significantly increased, which is surprising since the mean age of this group was 54. According to Frost et al. (1990), this scale reflects the tendency to believe that one's parents set very high goals and are overly critical. Perhaps learning techniques from an authority figure, being told to complete weekly homework, or building skills that can increase personal awareness rekindled sensations that the archers had at younger ages. Another possibility is that participants became more aware of their tendencies toward self-judgment, with an awareness that these demands may have originated in parental expectations. Since mindfulness has been described as nonperfectionism (Matkin, 2005), it is possible that, with more time to practice mindfulness skills, these athletes would experience the predicted decrease in perfectionistic tendencies.

Perfectionism has been associated with low confidence (Frost & Henderson, 1991), but both the archers and the golfers experienced some increase in sport confidence from before to after the MSPE training. The one increase that reached significance was the archers' increase in the dispositional optimism aspect of sport confidence. Research has shown that optimists have an inherent competitive edge over pessimists because they display coping patterns defined by continued positive striving (Manzo et al., 2001; Scheier & Carver, 1987). Confidence has been identified as crucial to the establishment of the balance between perceived challenges and skills that is characteristic of flow (Jackson, 2000). In fact, an analysis using the present sample revealed a significant positive relationship between the dispositional optimism aspect of sport confidence and the challenge-skill balance aspect of trait flow at baseline, $r = 0.72$, $p < .001$.

There were some setbacks in the current study involving the sport performance data, so that it was not possible to make comparisons among the scores reported by the archers. In addition, no significant performance enhancement change was found in the golfers' scores over the course of MSPE. This lack of performance improvement could partially be explained by the golfers' inconsistency in filling out their sport performance logs, which led to substantial missing data. Thus, we cannot draw conclusions regarding the performance enhancement utility of MSPE at this time. Future research might benefit from using predetermined, standard practice assignments for all participants and relying less heavily on the self-reporting of scores from typical performance routines. For example, studies involving archers

could standardize practice in terms of bow type, target type, target distance, and number of arrows scored. Perhaps having coaches/pros rate performance, as done with Gardner and Moore's Mindfulness-Acceptance-Commitment (MAC) approach to performance enhancement (Gardner & Moore, 2004, 2006, 2007; Lutkenhouse et al., 2007; Wolanin, 2005), would have dividends as well.

Although the current study did not identify a quantitative change in performance over the 4 weeks of MSPE training, postworkshop feedback from many of the athletes indicated that they thought the workshop did benefit their performance and that they expected additional benefits in the future. This data came from the approximately two-thirds of the participants who completed the Exit Questionnaire (EXT). Of course, it is impossible to know whether those athletes who did not complete the EXT had similar opinions. While two-thirds of the participants completed the EXT, far fewer of the participants consistently provided scoring data in their performance logs. Responses to the rating scales on the EXT indicated that, in general, the athletes felt the training had been at least somewhat successful at improving their sport performance and that they expected to be increasingly more satisfied with their performance over the next 5 years. On the open-ended items, three-quarters of the athletes who completed this measure predicted that the training would improve their performance quality and/or enjoyment if they continued to practice mindfulness, one-third said that the training helped them become more focused on the task at hand while participating in their sport, and over half indicated that the training improved their ability to cope with stress in their lives outside of their sport. The most common recommendation for how to improve the training was to lengthen it. Again, it is impossible to know whether those participants who did not complete the EXT had similar opinions.

Future improvements in athletic performance may be seen as resulting from an effect of mindfulness on the production of an "economy of effort" (Hatfield & Hillman, 2001). Reductions in nonessential cortical resources have been associated with high levels of skill in an activity (Hatfield & Hillman, 2001), since refinement in cortical activation is likely to result in smooth, fluid, and efficient movement (Hatfield, Haufler, Hung, & Spalding, 2004). Neuroimaging research on mindfulness is only in its infancy (e.g., Davidson et al., 2003), but future studies should evaluate this hypothesis.

There were some limitations to this study that future research on MSPE should address. Recruitment and scheduling complications precluded the use of viable control groups, limiting interpretations of the results to what changed over the course of MSPE, as opposed to what changes were caused by it. The relatively small number of participants and their inconsistent completion of the homework may have also contributed to some of the initial predictions not being supported. The sample used was not diverse in terms of ethnicity or age, so it is important not to generalize these findings to the entire population of archers or golfers. Finally, while the decision to make the training 4 weeks long may have had its recruitment benefits, it might take longer than a month for many of the predicted changes to occur, and, in fact, one of the common recommendations made by participants was for the workshop to be longer.

Despite these limitations, data from the current study suggest that MSPE has promise as an intervention to enhance flow, mindfulness, and aspects of sport confidence, and perhaps, upon further study, a performance enhancement method.

During a month in which these recreational athletes received this training, there were changes in both trait and state psychological factors that are considered crucial to successful performance. Future research with control groups and a range of athlete types should continue to investigate how MSPE can facilitate the attainment of flow or the zone through the enhancement of mindfulness, thus potentially helping athletes to achieve peak performance.

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Appendix

Summary Outline of the MSPE Treatment Protocol

I. Session 1 (approximately 2.5 hr)

A. Orientation and rationale
    1. Concept of the workshop
    2. Rationale for the workshop
    3. Important definitions associated with mindfulness training
    4. Review of key mental factors in the sport of focus
B. Group introductions
C. Raisin Exercise and discussion
D. Introductory mindful breathing exercise and discussion
E. Body Scan Meditation (45 min) and discussion
F. Wrap-up diaphragmatic breathing exercise (3 min)
G. Discussion of home practice for the week, which includes:
    1. Body Scan practice 3 times for 45 min each before Session 2
    2. Mindful breathing practice 3 times for 10 min each before Session 2
H. Session 1 summary and discussion

II. Session 2 (approximately 2.5 hr)

A. Body Scan Meditation (45 min) and discussion of home practice
B. Discussion of applications of meditation training to the sport of focus
C. Sitting Meditation exercise focusing on breath and body as a whole (15 min)
D. Mindful Yoga practice (45 min) and discussion
E. Wrap-up diaphragmatic breathing exercise (3 min)
F. Discussion of home practice for the week, which includes:
    1. Body Scan practice 1 time for 45 min before Session 3
    2. Sitting with breath practice 3 times for 15 min each before Session 3
    3. Mindful Yoga practice 2 times for 45 min each before Session 3
G. Session 2 summary and discussion

III. Session 3 (approximately 2.5 hr)

A. Mindful Yoga practice (45 min) and discussion of home practice
B. Extended Sitting Meditation (45 min) and discussion
C. Walking Meditation with specific applications to the sport of focus
    1. Walking Meditation practice (10 min)
    2. Walking Meditation applied to the sport of focus

D. Wrap-up diaphragmatic breathing exercise (3 min)
E. Discussion of home practice for the week, which includes:
    1. Body Scan practice 1 time for 45 min before Session 4
    2. Mindful Yoga practice 1 time for 45 min before Session 4
    3. Sitting Meditation practice 1 time for 30 min before Session 4
    4. Walking Meditation practice 3 times for 10 min before Session 4
F. Session 3 summary and discussion

IV. Session 4 (approximately 3 hr)

A. Sitting Meditation practice (30 min) and discussion of home practice
B. Body Scan practice (45 min) and discussion
C. Walking Meditation applied to the sport of focus (10 min)
D. Wrap-up diaphragmatic breathing exercise (3 min)
E. Workshop conclusion and discussion of continued practice
    1. Review strategies for continued practice
    2. Discussion of continued home practice, which includes:
    a. Mindfulness practice 6 times per week for 30–45 min per day