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Mindfulness for Long-Distance Runners: An Open Trial Using Mindful Sport Performance Enhancement (MSPE)

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The present study sought to determine the effects of Mindful Sport Performance Enhancement (MSPE) on runners. Participants were 25 recreational long-distance runners openly assigned to either the 4-week intervention or to a waiting-list control group, which later received the same program. Results indicate that the MSPE group showed significantly more improvement in organizational demands (an aspect of perfectionism) compared with controls. Analyses of pre- to postworkshop change found a significant increase in state mindfulness and trait awareness and decreases in sport-related worries, personal standards perfectionism, and parental criticism. No improvements in actual running performance were found. Regression analyses revealed that higher ratings of expectations and credibility of the workshop were associated with lower postworkshop perfectionism, more years running predicted higher ratings of perfectionism, and more life stressors predicted lower levels of worry. Findings suggest that MSPE may be a useful mental training intervention for improving mindfulness, sport-anxiety related worry, and aspects of perfectionism in long-distance runners.

Long-distance running requires mental training as well as physical training, and runners need strategies to deal with fatigue, boredom, pain, performance anxiety, and negative thoughts. The repetitive nature of running allows the mind to wander and lose attention to proper running technique and breathing, making it difficult to notice poor running form (B. Beall, personal communication, September 20, 2006). Long-distance running can also elicit fatigue and pain, which can trigger intrusive negative thoughts that interfere with running form, speed, and motivation (Dreyer, 2004).

It has been postulated that psychological skills training can be used to learn ways to better deal with these hindrances so that athletes can excel in their sport. In the field of sport psychology, several traditional cognitive-behavioral strategies include self-talk, thought stopping, goal setting, and imagery and mental rehearsal (Whelan, Mahoney, & Myers, 1991). Self-talk is a process in which athletes actively become aware of cognitions and emotions, evaluate them, and then give instruction

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to motivate themselves to break bad habits and acquire further skill (Hackfort & Schwenkmezger, 1993). In thought stopping, anxious, persistent, and detrimental cognitions are targeted and interrupted, replacing them with more positive and beneficial thoughts (Gravel, Lemieux, & Ladouceur, 1980). Goal setting is a motivational technique in which athletes set and clearly define their sport performance goals (Locke & Latham, 1985). Imagery and mental rehearsal involve visualizing and practicing a certain athletic task without muscular movement (Corbin, 1972). Finally, visuo-motor behavior rehearsal (VMBR) incorporates relaxation into imagery, which can later be applied while actually performing the sport and receiving performance feedback (Suinn, 1972).

The efficacy of these traditional mental training techniques has mixed support in the literature (see Gardner & Moore, 2006; Moore, 2003). Several studies show that positive self-talk allows athletes to feel more confident in their performance (e.g., Gunnell, 1994). Thought stopping is often used in sport, but the actual effects have been studied very little. One such study found that skiers who received thought stopping training performed significantly better than those without this intervention (Gravel et al., 1980). This training, however, contained other elements, making it difficult to isolate the specific effects of thought stopping. The efficacy of this technique has been questioned, and recent research suggests that thought stopping can actually make detrimental cognitions more pervasive and damaging (e.g., Beevers, Wenzlaff, Hayes, & Scott, 1999; Wegner, Broome, & Blumberg, 1997). Gardner and Moore (2006) also suggest that when athletes attempt to control their thoughts, as is done in thought stopping, their attention may be diverted from the competitive task at hand.

Athletes have reported the value of goal setting, but research indicates inconsistent results. When comparing sit-up performance of high school students who set specific goals to others who were told to "try your best," those who had a specific goal performed better (Tenenbaum, Weinberg, Pinchas, Elbaz, & Bar-Eli, 1991). Conversely, Weinberg, Bruya, and Jackson (1985) found no significant difference in sit-up performance for college students with and without goal setting. Goal setting may even harm athletic performance if the goal is unrealistically difficult, because failure to achieve this goal could hinder motivation and reduce self-efficacy.

Imagery is perhaps the most prevalent and extensively researched intervention technique for the enhancement of athletic performance (e.g., Isaac, 1992). A meta-analysis concluded that imagery in sport has a significant positive effect on performance (Driskell, Copper, & Moran, 2004); however, a number of researchers (Lamirand & Rainey, 1994; Lerner, Ostrow, Yura, & Etzel, 1996) have found contradictory results, suggesting that imagery decreases the efficacy of basketball free throw shooting.

To understand the inconsistent support for these traditional cognitive-behavioral methods, it is important to review the possible mechanisms of change. Traditional methods generally aim to increase awareness of negative cognitions and emotions and to control or eliminate them. Research, however, suggests that this manipulation of internal states does not consistently result in the enhancement of athletic performance and may in fact impede performance (e.g., Daw & Burton, 1994; Holm, Beckwith, Ehde, & Tinius, 1996). It has been argued that by consciously targeting and attempting to change or erase negative cognitions, a greater awareness will be brought to these cognitions, which in turn may increase their frequency, leading to even greater distraction and a possible decline in performance (Wegner, 1994).

For these reasons, innovative approaches were sought to steer clear of what Wegner (1994) termed the "ironic process of mental control." One such approach is the use of mindfulness meditation, which may avoid the paradoxical effects of cognitive self-monitoring (Moore, 2003). Mindfulness meditation, with roots in Buddhist Vipassana and Zen practices, does not aim to change cognitions, but rather to accept them nonjudgmentally and let them go, being fully aware of cognitions, emotions, and sensations in the present moment (Kabat-Zinn, 1990). Because mindful awareness may in some ways be similar to what has been described as "the zone" (Cooper, 1998), which is characterized by deep concentration, relaxation, and fusion of body and mind, enhanced mental states that are achievable through mindfulness may be particularly beneficial for athletes and their sport performance (Kabat-Zinn, Beall, & Rippe, 1985).

A frequently used mindfulness approach, Mindfulness-based Stress Reduction (MBSR), was first developed by Kabat-Zinn and his colleagues at the University of Massachusetts Medical Center (Kabat-Zinn, 1990). A review by Bishop (2002) concluded that MBSR is helpful in treating patients with physical ailments such as chronic pain (Kabat-Zinn, 1982) and fibromyalgia (Kaplan, Goldenberg, & Galvin-Nadeau, 1993). Specific to mental health, Baer (2003) conducted a review showing that approaches that include mindfulness have been effective as clinical interventions. Mindfulness-based strategies have successfully been used in treatments for recurrent depression (e.g., Teasdale et al., 2000), conduct disorder (Singh et al., 2007), borderline personality disorder (Linehan et al., 2006), anxiety (Kabat-Zinn et al., 1992), and eating disorders (Kristeller, Baer, & Quillian-Wolever, 2006) and has been shown to promote overall mental health (Bishop, 2002).

In the realm of sport psychology, Kabat-Zinn et al. (1985) developed the first mindfulness meditation training program for competitive athletes. This program ranged from 2-week to 7-month mindfulness meditation training periods for collegiate and Olympic-level rowing teams. Key elements of the program included formal practice of sitting meditation in both group and individual sessions, as well as with teammates just before races. Specific applications of meditation to rowing were also stressed (e.g., concentration associated with aspects of the stroke cycle, strategies to remain focused at key points in a race). Rowers reported improved relaxation, enhanced concentration, and reduced effects of fatigue and negative thoughts and said the meditation program helped with optimal performance. Yet although these results appeared promising, they require cautious interpretation because the study was not a randomized controlled trial and validated measures were not used.

Another intervention for athletes that includes mindfulness is Gardner and Moore's (2004, 2006, 2007) Mindfulness-Acceptance-Commitment (MAC) approach to performance enhancement. MAC places an emphasis on accepting internal experience, mindful attention, and improving commitment to action in the pursuit of desired goals, drawing on the work of Hayes, Strosahl, and Wilson (1999). Case studies have shown that MAC resulted in an increase in sport performance, although change in mindfulness was not assessed (Gardner & Moore, 2006). A nonrandomized controlled trial found that female collegiate field hockey and volleyball players who received MAC training, when compared with those with no intervention, experienced a greater enhancement in athletic performance and a greater improvement in overall mental health (Wolanin, 2005); however, Gardner and Moore proposed that athletes dealing with clinical or subclinical

psychological barriers require a modified version of the MAC protocol so that both subclinical/clinical and sport related issues can be appropriately addressed. Most recently, Gardner and Moore (2007) reported that a large randomized controlled trial (Lutkenhouse, Gardner, & Moore, 2007) found that athletes given the MAC protocol showed a significant increase in athletic performance compared with those receiving training in traditional psychological skills.

Mindful Sport Performance Enhancement (MSPE; Kaufman & Glass, 2006) is an additional approach to promote flow in athletes, primarily based on Kabat-Zinn's (1990) MBSR and Segal, Williams, and Teasdale's (2002) Mindfulness Based Cognitive Therapy (MBCT). To accommodate the schedules of busy participants who were neither elite athletes nor individuals seeking help for psychological problems, MSPE was designed as a 4-week program consisting of weekly sessions of 2 1/2–3 hrs each. Although allowing for less session time and introducing a sport-specific rationale, MSPE includes mindfulness exercises that are key to MBSR and MBCT including the raisin exercise, body scan, sitting meditation, mindful breathing, and mindful yoga, with an added walking meditation adapted to running.

MSPE has been used with both archers and golfers, and results indicate that the archers experienced an increase in overall mindfulness, enhanced dispositional optimism (an aspect of confidence) in their sport, and an increase in parental expectations (an aspect of perfectionism). In addition, the golfers experienced a significant increase in their ability to describe their experiences, an aspect of mindfulness (Kaufman, Glass, & Arnkoff, 2009). There were no significant changes in sport performance over the 4-week program. The authors reported that perhaps the most important finding from this initial, nonrandomized study was that the athletes' levels of state flow changed significantly over the course of the training, with an increase in state flow observed from week to week.

Long-distance running is similar to rowing in that it is a repetitive sport where boredom, fatigue, pain, and negative cognitions interfere with optimal performance. Although the benefit of mindfulness meditation for these athletes has not been previously studied, the techniques of mindfulness are not new concepts to long-distance runners. It has been argued that to best deal with repetition, boredom, fatigue, and pain, high-performance runners must learn to run using their mind-body connection. For example, Dreyer (2004), an ultra-marathoner, explained how focus and nondistractibility, letting thoughts move in and out of the mind, attending to the breath, and sensing the body and good posture are crucial to optimal running performance. It is interesting that these are all elements of training in mindfulness meditation.

The present open trial was the first to examine the efficacy of this specific form of mindfulness meditation for recreational long-distance runners, investigating the effects of MSPE on athletic performance, sport anxiety, and disruptive cognitions about running. The roles of several factors that we hypothesized to predict the outcome of MSPE were also explored. Given that Gardner and Moore (2006) reported that MAC had a larger treatment effect size for collegiate athletes with no subclinical psychological difficulties, we predicted that runners with more life stressors, dysphoric mood, and disordered eating would benefit less from the MSPE workshop. While not data-driven, we also predicted that those with a longer running history and prior experience with sport psychology or meditation would experience better outcomes. Finally, just as expectations have been shown to be associated with better outcome in psychotherapy (Arnkoff, Glass, & Shapiro, 2002),

greater positive expectations before the workshop were expected to be related to enhanced efficacy of MSPE.

Method

Participants

Twenty-five recreational long-distance runners from the Washington, DC area were recruited for this study. The sample was composed of 10 men and 15 women, ranging in age from 18 to 55 ($M = 34.73$), who regularly ran and competed (years competing $M = 6.68$) in long-distance races (1 mile races to marathons). On average, participants ran 4.82 days a week, totaling on average 26.89 miles per week. Four participants ran on the same university cross-country team and 10 were members of local running clubs. Participants were primarily Caucasian with one African American participant.

Approximately half of the runners were openly assigned to receive mindfulness training ($n = 13$). The remaining runners served as a waiting-list control group ($n = 12$), and received the training after completion of the initial mindfulness workshop. Nine participants in the experimental group completed all four sessions, three runners attended three sessions, and one dropped out after the first session due to health problems. Among the control group, seven runners completed all four sessions, three completed three sessions, and two participants dropped out after the first session due to scheduling conflicts.

Procedure

The athletes were recruited by contacting several running teams and clubs through e-mail messages and flyers sent to coaches, club leaders, trainers, and athletic shops. Flyers were also posted around several local college campuses. The e-mails and flyers described the study as an opportunity for recreational runners who want to improve their performance by attending mindfulness training and provided the first author's contact information.

Once enrolled, each runner was sent two copies of an informed consent form and a packet of baseline measures and questionnaires that assessed running history, general mental health, sport anxiety, typical cognitions during races, perfectionism, and mindfulness. They were asked to return one signed consent form along with completed questionnaires within four days. Eligible participants were then openly assigned to either the experimental or waiting-list control condition. Although the initial intent was to randomly assign all runners to one of the two groups, this is a nonrandomized study because only 10 participants were available for random assignment, and participant scheduling restraints necessitated allowing the other 15 runners to select the time of their workshop.

The workshop took place in a yoga studio at a local health club. During the first of four sessions of mindfulness training, the development and rationale of the workshop were explained and participants completed a measure that assessed their expectations for and perceived credibility of the workshop. Upon completion of each session, a state mindfulness measure was given to determine each participant's level of awareness and nonjudgmental acceptance. During the week between each

session, participants were asked to keep a record of their running performance and practice of mindfulness exercises. At the end of the final session, each athlete completed a questionnaire packet, which was similar to initial measures but with a modified background questionnaire and expectancy measure. Runners who did not attend the last session were mailed the packet and asked to mail it back within four days, and three out the four individuals complied.

Participants in the waiting-list condition were also asked to document their running performance over these four weeks using the same running performance log. In addition, they completed the questionnaires again before beginning their own four weeks of mindfulness training (after the experimental condition completed the workshop). At the conclusion of both workshops, participants were asked to continue recording their running times and meditation practice for 6 months for follow-up purposes.

Mindfulness Workshop

The mindfulness training used Kaufman and Glass' MSPE (2006; see also Kaufman et al., in press, for a detailed description), which consists of shortened techniques drawn from Kabat-Zinn's (1990) MBSR and Segal et al.'s (2002) MBCT along with a walking meditation applied to the sport of interest. The manual was modified by the first author to be relevant for long-distance runners. Specifically, the rationale was changed to explain the usefulness of mindfulness to overcome distractibility, poor running form, pain, and fatigue associated with the repetitive and arduous nature of running. The walking meditation was practiced with a slow-pace running form, and a review of proper running form was included to help participants be more mindful during these exercises. In addition, vital points in practice or a competition (e.g., while stretching, stepping up to the starting line, at each mile mark, and completing the race) were highlighted, reminding the runner to remain focused and be mindful of proper running form and breathing. Additional literature (Benson, 1975; Gallwey, 1974; Gardner & Moore, 2004, 2006, 2007; Goleman & Schwartz, 1976; Gontag, 2004) was integrated into the manual along with suggestions from Bruce Beall (personal communication, September 20, 2006), an Olympic rower who participated in and coauthored a poster based on the first mindfulness study applied to athletes (Kabat-Zinn, et al., 1985).

The program consisted of four weekly 2 1/2–3 hr sessions led by the first author. During the first session, the rationale was explained, followed by Kabat-Zinn's (2002) 45-min body scan meditation, concluding with mindful breathing. The three subsequent sessions taught exercises such as extended sitting with the breath, mindful yoga, and walking meditation, and participants continued to rehearse the skills from previous weeks. Each session included discussions of the meditations and how to apply these techniques to running. Between sessions, participants were asked to rehearse these skills with the aid of Kabat-Zinn's CD program (Series #1; Kabat-Zinn, 2002), to practice applications while running, and to document their rehearsal in a mindfulness log.

Measures

Background Questionnaire. Designed for this study, this measure asks participants for running performance information and demographics such as

age, ethnicity, and gender. Athletes describe their running history, experience, and personal best competitive and practice running time over their lifetime and over the past 12 months. These running times were used as a measure of sport performance. Five open-ended questions ask why participants run, whether they are still developing their running skills, whether their competitive performance was better in the past, whether they run when injured, and what they hope to get out of the workshop. Eight additional questions ask about psychological health, specifically about stress, mood, and eating disorders. These include two life stressor questions that ask participants to describe any life issues and stresses that they are currently experiencing, and whether they think these concerns could be affecting their running. Two questions assessing dysphoric mood are similar to those in the Structured Clinical Interview for *DSM-IV* (SCID; First, Spitzer, Gibbon, & Williams, 1997) and ask for ratings of frequency of diminished interest and depressed mood on a 4-point scale, ranging from 0 (*not at all*) to 3 (*nearly every day*). Three dichotomous items were adapted from Garner, Olmstead, and Polivy's (1983) Eating Disorder Inventory (EDI) and ask about noticeable weight loss, fears of becoming fat, and body dissatisfaction. To study the effects of psychological health on participants' response to the workshop, three predictor variables were calculated: a life stressor score (a tally of number of issues reported), dysphoric mood (the sum of the two mood ratings), and disordered eating (the number of affirmative answers to the three EDI items). Finally, four additional items ask participants to describe prior experience they have had with sport psychology and meditation, including the frequency and type of meditative exercises individuals have practiced.

Sport Anxiety Scale (SAS). The SAS (Smith, Smoll, & Schutz, 1990) is a 21-item self-report measure of cognitive and somatic trait sport anxiety. Items are rated on a 4-point Likert scales ranging from 1 (*not at all*) to 4 (*very much so*), with subscales for somatic anxiety, worry, and concentration disruption. The SAS has been shown to have good construct and convergent validity, internal consistency, and test-retest reliability (Smith et al., 1990). Dunn, Dunn, Wilson, and Syrotuil (2000) investigated the factorial composition of the three subscales and found that two items did not load as expected on the concentration disruption subscale. In response, the scale developers recommend a new scoring system that does not include these two items (Smith, Cumming, & Smoll, 2006). The revised scoring was used in the current study.

Thought Occurrence Questionnaire for Sport (TOQS). This 17-item self-report measure is designed to assess athletes' cognitive interference during competitions (Hatzigeorgiadis & Biddle, 2000). The instructions were revised so that participants based their answers on their cognitions during a typical race. Items are rated on a Likert scale ranging from 1 (*almost never*) to 7 (*very often*), and there are three subscales: task-irrelevant thoughts, task-related worries, and thoughts of escape. This measure has been found to have good concurrent validity, convergent validity, and internal consistency (Hatzigeorgiadis & Biddle, 2000).

Multidimensional Perfectionism Scale (MPS). The 35-item MPS (Frost, Marten, Lahart, & Rosenblate, 1990) is one of the most frequently used instruments measuring self-reported trait perfectionism (Gotwals, Dunn, & Wayment, 2003). The items are rated on a 5-point Likert scale ranging from 1 (*strongly disagree*)

to 5 (*strongly agree*). The MPS contains six subscales: personal standards, parental criticism, parental expectations, organization, concern over mistakes, and doubts about actions. This measure has been found to correlate well with other perfectionism measures and has good internal consistency for the total score and for all six subscales (Antony, Orsillo, & Roemer, 2001; Frost et al., 1990).

Kentucky Inventory of Mindfulness Skills (KIMS). This 39-item instrument measures an individual's general tendency to be mindful (Baer, Smith, & Allen, 2004). Items are rated on a 5-point Likert scale ranging from 1 (*never or very rarely true*) to 5 (*very often or always true*). The KIMS contains four subscales: observing, describing, awareness, and acceptance without judgment. This measure has been shown to have good test-retest reliability, internal consistency, and content validity (Baer et al., 2004).

Credibility and Expectations Measure (CEM). The CEM (Kaufman et al., in press) is an adaptation of Borkovec and Nau's (1972) credibility and expectations measure and Holt and Heimberg's (1990) Reactions to Treatment Questionnaire. The CEM consists of eight items using a 10-point Likert scale with varying anchor descriptions, customized for runners in the current study. The first four items assess perceived credibility of the workshop, and the remaining items measure anticipated satisfaction with running performance following the workshop.

Toronto Mindfulness Scale (TMS). The TMS (Lau et al., 2006) is a 13-item self-report instrument that assesses state levels of mindfulness and has been shown to have good internal consistency and criterion validity (Lau et al., 2006). Items are rated on a 5-point Likert scale ranging from 0 (*not at all*) to 5 (*very much*), reflecting the level of acceptance and awareness while engaging in mindful activities. The TMS contains two subscales: curiosity and decentering. An earlier 42-item version of the TMS, obtained from the authors, was used in the current study, but only the 13 items in the recently published scale were used in analyses.

Postworkshop Questionnaire. This measure, a modification of the initial background questionnaire, asks participants for their current sport performance and psychological health. A sport performance score, which served as a postworkshop outcome variable, was obtained by calculating each runner's fastest mile time based on the running times and distances he or she reported. The same life stressor and mood items from the background questionnaire are included, but not the history of noticeable weight loss eating disorder item. Four open-ended questions ask whether participants' reasons to run changed during the workshop, whether they were still developing their running skill, whether they have reached their peak performance, and to what degree, if at all, the workshop helped deal with life stressors. Six additional items ask participants for their reaction to, feedback on, and evaluation of the workshop. Specifically, these questions ask what participants liked most and what was most helpful, how applicable the workshop was to running and their overall life, what was most challenging, what further recommendations would improve the workshop, and whether they foresee continuing to practice mindfulness meditation.

To code the open-ended questions in the background and postworkshop questionnaires, the responses were unitized, and an extensive coding manual was developed. Two undergraduate raters were trained to use the coding manual, and obtained high interrater reliability on practice items (kappa = .70–1.00).

Running Performance Log. A modification of the measure developed by Kaufman at al. (in press) asks participants to record their running frequencies, type of running activity, distances, times, and satisfaction with time and run on a 5-point Likert scale ranging from 1 (*not at all satisfied*) to 5 (*very satisfied*).

Mindfulness Practice Log. The log, designed by Kaufman and colleagues (in press) and adapted from Segal et al.'s (2002) Homework Record Form, asks for the date, duration, and comments on mindful practice.

Results

Preworkshop Comparison of Experimental and Control Groups

Regarding the demographic variables of age, gender, and ethnicity, analyses revealed that only gender showed a significant between-group (experimental and waiting-list control) difference, χ^2 (1) = 5.24, $p < .05$, with significantly more women in the control group. Gender differences in mindfulness and response to mindfulness interventions are typically not found (e.g., Mackillop & Anderson, 2007; Malcoun, 2009). Thus, the greater number of women in the comparison group is unlikely to have created a confound in the analysis. Groups did not differ significantly in running experience, running distance, and frequency; on the four preworkshop trait measures of sport anxiety, perfectionism, thought disruption, and mindfulness; or on the predictor variables of life stressors, dysphoric mood, and eating concerns.

Credibility of the Workshop

Self-reports on the CEM given during the first session (which for controls came after they completed their time on the waiting list) indicated that participants in both groups perceived the workshop to be credible, with no significant differences between the groups (experimental $M = 30.33$, control $M = 28.70$). They also expected a beneficial outcome from participating in the workshop (experimental group $M = 30.33$, controls $M = 30.60$). These differences were not significant.

Comparison of Experimental and Control Groups on Outcome

A series of ANCOVAs were conducted on all trait and sport performance measures comparing postworkshop scores for the 12 runners in the experimental group who were considered to be completers of the workshop (3 or 4 sessions) with those of the controls at the end of their 4 weeks on the waiting list, using preworkshop scores as covariates. A significant difference was found for the organization subscale of the MPS, $F(1,19) = 6.20$, $p < .03$. Those in the experimental group ($M = 22.17$) reported feeling significantly fewer organizational demands upon completion of the workshop compared with controls ($M = 24.90$). There were no other significant differences on outcome measures between the experimental and waiting-list control groups, although several trait measure means (SAS worry, TOQS task-related worries, and MPS total score and personal standard and organization subscales) were in the direction of more beneficial change for the treatment group. In addition,

there were no significant differences between the groups on sport performance, including changes in mile running time, average running distance, or average running frequency per week.

Change Across all Participants on Dispositional, State Mindfulness, and Sport Variables

Because there were few differences between the experimental and control groups, the groups were combined to address whether there was change (for those completing at least 3 sessions) from before to after the workshops, using dependent *t* tests.

Dispositional Measures. Participants demonstrated a significant decrease in sport anxiety-related worry, ratings of personal standards perfectionism, and parental criticism, along with a significant increase in awareness (an aspect of mindfulness) from before to after the workshops (see Table 1).

Table 1 Pre and Postworkshop Means and *t* Tests for All Participants on Dispositional Variables

	Time		
Trait Measure	**Pre**	**Post**	***t*-value**
Sport anxiety	39.62	35.52	1.46
Somatic anxiety	12.48	12.29	.14
Worry	15.57	13.09	2.35*
Concentration disruption	11.57	10.05	1.78+
Perfectionism	105.21	100.47	1.48
Concern over mistakes	23.00	21.58	1.34
Personal standards	26.26	24.42	2.26*
Parental expectations	12.68	12.63	.08
Parental criticism	9.00	7.95	2.25*
Organization	24.68	23.58	1.43
Doubts about actions	9.58	10.74	1.66
Thought disruption	55.53	55.57	-.02
Task-Related worries	20.26	18.47	1.65+
Task-irrelevant thoughts	19.89	20.00	.07
Thoughts of escape	20.26	18.47	-.56
Mindfulness	127.65	129.75	.75
Observe	41.00	41.80	.82
Describe	29.45	30.00	.52
Act with awareness	25.10	28.30	4.33*
Accept without judgment	29.90	29.65	.21

Note. For these analyses, $n = 22$.

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

State Mindfulness. The state mindfulness measure was completed following mindfulness exercises each week of the 4-week workshops. A repeated-measures ANOVA for the eight participants who filled out the TMS at all four sessions revealed that there was a significant increase in the decentering aspect of mindfulness, $F(1, 7) = 7.11$, $p < .05$, but not in curiosity or total score. However, when the 16 participants who completed the TMS at both the first and final sessions were compared, significant increases in both decentering and total mindfulness were found (see Table 2).

Table 2 Means and *t* Tests for State Mindfulness Variables

State Measures	Week 1	Week 4	*t*-value
Mindfulness	29.00	34.38	2.30*
Curiosity	13.13	15.00	1.57
Decentering	15.44	19.81	3.31*

Note. n for these analyses = 16.

*$p < .05$.

Sport Performance. A dependent t test on the best mile times from the background questionnaire to the postworkshop questionnaire revealed no significant changes in sport performance. There was a significant decrease in average weekly running mileage, $t = 2.21$, $p < .05$ (preworkshop $M = 26.89$, postworkshop $M = 23.30$), and weekly running frequency, $t = 3.01$, $p < .05$ (preworkshop $M = 4.80$, postworkshop $M = 4.21$).

Predictors of Change

Participant characteristics that may predict the effectiveness of the workshop were also examined, including preworkshop reports of number of life stressors, ratings of depressed mood, disordered eating, credibility/expectations of the workshop, and years as a competitive runner. Dependent variables in the hierarchical regressions were postworkshop total scores for the measures that showed change on at least some subscales (sport anxiety, perfectionism, and trait mindfulness). In each regression, the variable entered on the first step was the preworkshop score on the measure. The predictor variable was added on the second step to determine if it was associated with the respective postworkshop outcome, over and above the preworkshop score.

Of the 15 regression analyses (five potential predictor and three outcome variables), three showed significant predictor effects. On the MPS (trait perfectionism), the preworkshop score was significantly related to the postworkshop score, $R^2 = 0.43$. When the rating of credibility and expectations for the workshop was added to the model, R^2 change was 0.13, $p < .05$. The β was –.36, indicating that the higher rating of expectations and credibility, the lower the reported perfectionism at the end of the workshop. Furthermore, when years as a competitive runner was added to the model, R^2 change was 0.131, $p < .05$. The β was 0.90, indicating that the more years competing, the higher the perfectionism rating postworkshop.

On the SAS (state sport anxiety), there was a significant effect of number of life stressors endorsed. The preworkshop score significantly predicted the postworkshop score, $R^2 = 0.23$. The change in R^2 when number of life stressors was added to the model was .19, $p < .05$. The β was –.46, indicating that the more life stressors the participants reported before the workshop, the lower the ratings of sport anxiety worry after the workshop.

In addition, the effects of two nominal variable potential predictors were analyzed using *t* tests. There were no significant differences in change from before to after the workshop on any sport performance or trait measures between participants who had had prior experience with sport psychology ($n = 7$) and those who had not ($n = 12$), nor any differences between runners with ($n = 16$) and without ($n = 6$) prior meditation experience.

Discussion

This study is the first in the literature to use a mindfulness protocol as psychological skills training for recreational long-distance runners. It is also only the second study implementing Kaufman and Glass' (2006) Mindful Sport Performance Enhancement (MSPE) training.

Results revealed one significant difference between the nonrandomized experimental and waiting-list groups, where those who received the workshop reported fewer organizational demands. The Organization subscale of the perfectionism measure (MPS) is theorized to capture an overemphasis on precision, neatness, order, and rigid organization (Frost et al., 1990). Aposhyan (1995) found that participants experienced decreased perfectionistic desire for ideal emotional responses in social situations after receiving Morita therapy, which incorporates moment-to-moment awareness and acceptance. By accepting flaws and not being distraught by them, those who practice mindfulness may experience diminished desire to achieve perfection because the individual can more easily acknowledge being imperfect. However, the fact that this was the only difference between conditions leaves open the possibility that this finding may have been by chance alone.

There are several possible reasons why the workshop runners did not do better than the controls on most measures. First, the workshop was designed to be 4 weeks in length to maximize the number of completers, but 80% of participants said on the postworkshop questionnaire that a longer program may have been more beneficial. Other mindfulness-based interventions (e.g., MBCT, MBSR, MAC) are at least 8 weeks in length, which allows greater time for implementation and practice during the programs. Yet, several brief mindfulness interventions for nonclinical populations (e.g., nurses and students) have been found to lead to significant improvement (Jain et al., 2007; Mackenzie, Poulin, & Seidman-Carlson, 2006).

In addition, a greater number of participants would allow greater power to detect actual differences between groups, since most means were in the expected direction. In the future, it could be beneficial to recruit participants at races or club training events and through high school and collegiate cross-country teams and to do extensive advertising on running websites and running club e-mail listserves. One should also consider the possibility that the paucity of differences between the MSPE group and controls was due to an inability for the MSPE program to impact the most important mechanisms of change; however, similar but lengthier

programs (e.g., MBCT, MBSR) that were the foundation of MSPE demonstrate empirical support with certain populations, showing significant benefits of mindfulness (see Baer, 2003). Perhaps future research with a lengthier MSPE program and more practice may be needed. An additional consideration is that participants in the study were recreational runners and may not have been as dedicated to their sport as Kabat-Zinn et al.'s (1985) elite rowers, and therefore may not have been as invested in running improvement. Possible revisions to develop the program further would be to include a greater emphasis on integrating mindfulness and performance enhancement with more detailed sport adaptations, as well as an intensive mindfulness retreat (similar to MBSR).

When the two groups were combined, significant changes were found from before to after the workshop. There were significant increases in both dispositional mindfulness (acting with awareness) and state mindfulness (especially decentering). Furthermore, significant decreases were found in sport anxiety worries, and perfectionism dealing with parental criticism and personal standards. As seen in previous reviews of mindfulness interventions (e.g., Hamilton, 2006), mindfulness increased along with beneficial changes in mood and stress reduction. Enhanced mindfulness encourages individuals to become more open, aware of, and accepting of their experiences (Bishop et al., 2004).

Increased mindfulness may thus allow participants to develop better acceptance of any experience of anxiety around running and to not let their worries distract and bother them as much. Runners often describe a good run as one being absent of distracting cognitions, such as worries and judgments about the run or themselves, because they are completely "in the moment" of their run (Gontag, 2004). In a large randomized controlled trial of MAC on Division I collegiate athletes, Lutkenhouse and colleagues (2007) also found that Gardner and Moore's MAC approach (2004, 2006, 2007), which includes mindfulness training as one important component, enhances an athlete's attention, thus decreasing their concentration disruption. Our MSPE workshop also includes exercises to help foster this moment-to-moment acceptance of performance-related cues and nonjudgment of internal and external states. Internal judgment can lead to an increasing pressure for perfectionism, specifically dealing with high personal standards, which may get in the way of optimal sport performance (Flett & Hewitt, 2005). Perhaps these high personal standards may in part come from feeling parental criticism as a child and thus striving for personal perfectionism to please these parental figures. Acquiring mindfulness skills may lead to less judgmental self-evaluations and thus a decrease in a personal and parentally influenced need for perfectionism.

Klinger, Barta, and Glas (1981) found that when collegiate basketball players focused more on self-judging cognitions and anticipatory anxieties, rather than game-related cues, they experienced impaired performance. These cognitions may provoke additional worry, causing a disruption in sport-relevant thoughts and behaviors. Roemer and Orsillo (2007) conducted an open trial of an acceptance and mindfulness based intervention for patients with generalized anxiety disorder (GAD) and found a significant reduction in symptoms of anxiety, worry, and depression. The results support prior theories that experiential avoidance plays a role in severe worry (e.g., Barlow, 2004), as acceptance and mindfulness skills allowed those with GAD to allow their internal distress and let it accompany them during their pursuit of their valued goals, instead of acting to move away from it (Roemer

& Orsillo, 2007). In the current study, the decrease in running-related worry may suggest enhanced acceptance and comfort. By being better able to be aware of and accept the experience of anxiety and negative cognitions, without self-judgment, the runners in the current study may have had fewer past-and future-oriented running-related worries and concentration disruption.

Based upon previously presented theories, it is possible that with modification of the intervention, randomization, and a larger sample of motivated athletes, greater efficacy findings may be found. As many as 80% of the participants said on the postworkshop questionnaire that they were able to apply the skills they learned in the workshop to help deal with the stress in their life, thus helping with their overall well-being.

It is also important to note that the results failed to show significantly enhanced athletic performance. Upon completion of the workshop, 81% of runners indicated on the postworkshop measure that with continued mindfulness practice they expected their running to benefit and improve, along with helping them deal with the stress in their lives. Failure to show performance improvement was also found by Kaufman and colleagues (2009) when they used the MSPE. In response to their findings of no significant performance enhancing effects from MSPE, the authors suggested that because the integration of mindfulness and sport was a new skill for the participants, it might have been difficult for athletes to improve sport performance in just a matter of four weeks. The authors argued that perhaps the MSPE workshop should be longer and that more practice implementing mindfulness in the sport may be needed after the workshop. Although change was found on psychological variables in the current study, we agree that it is possible that a longer program with more practice may be needed to see performance enhancement benefits, although future research is needed to address this speculation. Future research could schedule several identical sessions per week over a 6- to 8-week period, and offer the participants a choice of which one to attend. Offering incentives to attend one session per week, such as time to work out in the gym or gift certificates to athletic stores, could also be beneficial. Alternatively, it is possible that mindfulness alone may not be sufficient for enhancing performance. A comparison of a longer version of MSPE with an intervention such as Gardner and Moore's manualized MAC protocol (which has shown significant performance enhancing effects), could help to answer this question, although these two interventions have significant theoretical and technical differences.

A limitation in the measurement of running time may have also contributed to not finding a change in performance. Because runners reported times for a range of chosen distances, a common metric for runners' mile run times was calculated by dividing each reported time by the related distance; however, this resulted in a faster average mile time for shorter races than when the same runner ran a longer race. To more accurately assess sport performance change, further studies could ask specifically for the time of the best mile run to have a consistent measure to compare running times before and after MSPE training. Another solution would be to time the workshop to coincide with a certain race schedule. For example, participants could be recruited from among runners who compete in a race of a specific length and who would be willing to compete in another similar race upon completion of the workshop. Comparing these racing times could possibly give a more precise measure of sport performance change.

It was hypothesized that with the workshop and practice assignments and logs, participants would feel more motivated to run longer and more often, but this was not the case. Participants possibly ran shorter distances and ran fewer days a week because they were instead spending more time attending the workshop and practicing mindfulness skills. The workshops were held in the winter, just before Thanksgiving and then again just before Christmas. Poor running weather and obligations associated with the holidays may have also contributed to decreased allotted time to run. In addition, four participants experienced minor injuries or fatigue after competing in races, which forced them to run less.

Previous research has found that certain psychological difficulties and life stressors seem to influence the effectiveness of performance enhancement training in general. Gardner and Moore (2006, 2007) have discussed how athletes with clinical or subclinical difficulties (e.g., stress, anxiety, depression, eating disorders) typically require a modified MAC intervention so that subclinical/clinical and sport-related issues can both be dealt with in an appropriate manner. In the current study, those who reported more life stressors experienced lower levels of sport anxiety worry at the conclusion of the workshop. These athletes, when compared with those without such concerns, may have been more willing and eager to apply the workshop techniques more generally to help alleviate their subclinical/clinical symptoms, and therefore may have had more extensive opportunities to acquire heightened mindfulness. Other recent research has demonstrated the efficacy of acceptance-based behavioral therapy, MBCT, and MBSR for decreasing anxiety in patients with diagnosable anxiety disorders (Evans et al., 2008; Kabat-Zinn et al., 1992; Roemer & Orsillo, 2007). More than half of the participants reported being able to apply their newly acquired mindfulness skills to these issues as well as to their sport. As been previously argued, mindfulness training encourages "mindful responding" to life events instead of "mindless reactions" to life stressors, which in turn may lead to greater mindfulness (Gardner & Moore, 2007). In terms of measurement of clinical problems, Gardner and Moore (2004, 2006, 2007) used a short yet comprehensive interview to determine whether any of the participants had subclinical or clinical concerns so they could be effectively addressed, whereas due to time constraints, the current study only used a subset of five items from both the SCID and EDI (Garner et al., 1983), along with several created for the study asking about life stressors, and was not seeking to address subclinical/clinical concerns. Further research should use the full SCID or another well-validated diagnostic measure to potentially diagnose any subclinical or clinical difficulties before MSPE.

The current study did not find that prior familiarity with sport psychology or meditation was related to the efficacy of the workshop; however, we found that greater expectations and credibility of the workshop as a sport intervention predicted a greater reduction in perfectionism. This finding is consistent with theory and findings (e.g., Arnkoff et al., 2002; Frank & Frank, 1991; Snyder, Ilardi, Michael, & Cheavens, 2000) that positive expectations help foster motivation and hope, which are conducive for a more beneficial outcome.

In terms of running experience, participants who were more experienced with competitive running reported a higher rating of perfectionism at the end of the workshop. It can be argued that these runners were perhaps in general more competitive, and while receiving this sport performance intervention they may have more naturally experienced a heightened level of competition than others in

the group. This may have led to increased pressure for higher personal standards and a more perfect performance.

One additional limitation of the study merits further discussion. Although random assignment to experimental and control groups was the goal, this could not be achieved due to scheduling difficulties on the part of several participants. Thus, the study was an open trial instead of a randomized-controlled trial. Unlike some other studies of mindfulness for athletes (e.g., Kabat-Zinn et al., 1985; Kaufman et al., in press) that did not have a control group, the current study allowed a comparison of experimental and control outcomes.

Future studies of MSPE should also consider applications to team sports, such as basketball and baseball. The team mentality may influence the outcome because team members may feel more motivated to practice the workshop skills together as part of their regular team practice. MSPE training may additionally serve as a team bonding experience. In addition to more research with waiting-list controls, comparisons of MSPE to Gardner and Moore's MAC protocol (2004, 2006, 2007) and also to other traditional CBT interventions (e.g., VMBR; Suinn, 1972) are important. For example, MAC was recently compared with psychological skills training in a large randomized controlled trial, demonstrating significant results (see Gardner & Moore, 2007). It is also possible that different *types* of athletes from different sports or with varying psychological issues might benefit more from a mindfulness-based approach versus one that focuses more on trying to change or eliminate cognitions, which is the case for traditional psychological skills training methods.

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