MIGRAINES AND MINDFULNESS MEDITATION:
DOES ENGAGING SPIRITUALITY MAKE A DIFFERENCE?

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ABSTRACT
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Studies suggest that mindfulness training improves quality of life among persons with chronic pain (e.g., Kabat-Zinn, Lipworth & Burney, 1985), and researchers have begun examining how and why mindfulness training may be effective in this regard (e.g., Sauer & Baer, 2010). This is one of the first studies to examine whether spirituality is an active ingredient in mindfulness interventions (Kristeller, 2010; Rosch, 2007). Migraineurs were randomly assigned to training in one of three techniques: relaxation (R), regular mindfulness (RM), and spiritual mindfulness (SM). The R group was given little instruction other than to clear the mind and release tension; the RM group was trained using a mindfulness-of-breathing script; and the SM group was trained using a spiritual version of the RM script, encouraging participants to conceptualize mindfulness in a manner that is consistent with their own spiritual background and beliefs. After two weeks of practicing their assigned technique for 20 minutes a day, participants completed measures assessing pain, headache, psychological well-being, spirituality and mindfulness. In light of results from similar studies on secular and spiritual mantra meditation (Wachholtz & Pargament, 2005 & 2008), it was hypothesized that the SM group will experience the greatest benefits, followed by the RM group, and lastly the R group.

Results partially supported hypotheses. Two outcomes measures were shown to differ significantly by condition: stressfulness of the cold-pressor task and state mindfulness. Both mindfulness groups experienced the cold pressor task as significantly less stressful relative to the simple relaxation group. RM and SM groups were not found to be significantly different from each other in their reported stressfulness of the cold-pressor task. The SM group reported
significantly greater state mindfulness relative to the RM and R groups. RM and R groups did not report significantly different state mindfulness. All groups experienced significant improvement on pre-post measures of depression, spiritual experiences, and headache management self-efficacy, but no time-by-condition interactions were significant. These results, along with moderator analyses and bivariate correlations between religious/spiritual measures and mindfulness measures, provide initial evidence that spirituality may be a resource in developing mindfulness.
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INTRODUCTION

One behavioral intervention for chronic pain that is receiving increasing attention in the literature is mindfulness meditation. While researchers have theorized and begun testing a number of hypotheses about the active ingredients of mindfulness interventions as they apply to chronic pain populations, very few have examined spirituality as a possible active ingredient (Kristeller, 2007; Kristeller, 2010; Rosch, 2007). In some ways this is not surprising, given that the form of mindfulness meditation most commonly studied in the literature was created expressly to bring mindfulness into medical settings without the religious teachings attached (Kabat-Zinn, 1990; Kristeller, 2010). In light of this gap, the aim of the present study was to examine the spiritual framework of mindfulness meditation as a possible active ingredient in mindfulness interventions, focusing on the efficacy of mindfulness for migraineurs in particular. The present study tested the hypothesis that engaging spirituality more explicitly during brief mindfulness instruction would lead to enhanced outcomes over a more standard mindfulness protocol among individuals suffering from migraine.

For the purposes of this paper, I use Pargament’s definition of spirituality as a “search for the sacred,” where sacred is characterized by these three qualities: transcendence, which refers to the felt presence of a reality or a being that is wholly different from our ordinary experience; boundlessness, meaning having no limits in space or time—lasting forever or pervading the entire universe; and ultimacy, referring to the experience of something as fundamental to the nature of reality, at the heart of the mystery of the universe and of all human experience (Pargament, 2007). For the purposes of this paper, then, components of mindfulness training may be recognized as spiritual when they explicitly engage concepts which practitioners would experience as transcendent, boundless and ultimate. To illustrate, elements of meditation
training which construe meditation merely as a technique to improve concentration and induce physiological relaxation would be non-spiritual. In contrast, elements which construe meditation as a medium through which one may make contact with a transcendent reality—for instance, nirvana or the presence of God—would be spiritual.

While some may argue that Buddhism at its core involves little that is spiritual in the sense defined here (e.g., Batchelor, 1997), this paper will take the view that Buddhism as it is often practiced does in fact contain spiritual elements. Supporting this view, the Buddha is often revered as the embodiment of transcendent qualities and even may take on divine attributes (particularly in Mahayana Buddhism). Also, nirvana may be seen as representing the eternal as opposed to the temporal (Stace, 1960; Gethin, 1998), and some Buddhist practices aim to induce the reverence and awe associated with spiritual practices and contexts (Emmons, 2005), often by referencing sacred concepts (such as the Buddha or nirvana). A more thorough treatment of this matter may be found in Stace (1960) and Gethin (1998).

Another concern some researchers and mindfulness teachers may have is that spiritual concepts and stories (as they are defined here) are incompatible with classical mindfulness as it is meant to be practiced: often mindfulness teachers see the non-conceptual nature of mindfulness as the source of its efficacy, and portray mindfulness as cutting through concepts and stories, including spiritual ones (e.g., Gunaratana, 1992; Nyanaponika, 1973; Goleman, 1977). For this reason, in addition to reviewing other relevant literature, the author aims to show in the course of the following discussion that a spiritualized mindfulness protocol is not a distortion of mindfulness practice, but rather makes explicit an element of practice that at least some mindfulness teachers suggest can complement and even enhance mindfulness training (e.g., Kabat-Zinn, 1990; Hanh, 1976/1987). Before addressing the relationship between mindfulness
and spirituality in more detail, our focus turns to migraine headache and the utility of non-pharmacological means, including mindfulness training, for treating pain, distress and disability associated with this disorder.

**Migraines**

Migraine headache is a chronic disorder marked by episodic attacks of head pain, often accompanied by photophobia, phonophobia, nausea, and vomiting. Most migraineurs experience premonitory symptoms prior to the onset of head pain, which may include repetitive yawning, concentration problems, and neck stiffness (Linde, 2006). Sometimes migraines are preceded by aura, which refers to transient sensory or other neurological disturbances, usually lasting less than an hour (Linde, 2006). In order to meet criteria for migraine according to the International Headache Society, a person must have experienced multiple headache attacks which last 4 to 72 hours and are of moderate or severe pain intensity—at least two accompanied by aura to meet criteria for migraine with aura, and at least five to meet criteria for migraine without aura. Migraine without aura is the more common diagnosis (International Headache Society, 2005).

Migraines are among the 20 leading causes of disability worldwide (Leonardi, Steiner, Scher, & Lipton, 2005). A recent study found that 22.1% of migraineurs are severely disabled, while 48.2% are at least somewhat impaired (Lipton, Bigal, Diamond, Freitag, Reed, et al., 2007). Research suggests that migraineurs experience as much distress as a result of their condition as do people suffering from heart disease, lung disease, diabetes, arthritis or back problems (Koopmans & Lamers, 2002). Over half of migraineurs experience attacks severe enough that they require bedrest (Linde, 2006; Lipton, et al., 2007), and a third experience attacks three or more times per month (Lipton, et al., 2007). While much of the impairment experienced by migraineurs occurs during a migraine episode, migraineurs experience significant
Migraines have significant psychological costs as well. Rates of suicidality, depression and anxiety are much higher among migraineurs than among the general population (Linde, 2006). There is some evidence that onset of migraine may cause this elevated psychopathology and distress: a longitudinal study showed that a diagnosis of migraine headache at baseline significantly predicted first onset major depression over the course of the two-year study (OR = 5.8; 95% C.I. 2.7-12.3; Breslau, Lipton, Stewart, Schultz, & Welch, 2003). Possible mediators of this causal influence include feelings of helplessness experienced in response to a headache and fear of future headache attacks (Passchier, de Boo, Quaak, & Brienen, 1996). Some patients report that they avoid situations which might provoke an attack or which would make dealing with an attack more difficult—for example, a long drive or a plane flight (Buse, Rupnow, & Lipton, 2009).

Migraine headache is a relatively common disorder. Three studies—conducted in 1989, 1999, and 2000—yielded similar results as to the one-year prevalence rate of migraine headache in the United States: 12% of people overall, 18% of women, and 6% of men were found to meet criteria for migraine headache according to International Headache Society criteria (Robbins & Lipton, 2010). A study of lifetime incidence rates (the number of cases of migraine headache per person) suggests that 43% of women and 18% of men will experience diagnosable migraine
headache over the course of their lifetime (American Migraine Prevalence and Prevention study, 2004; as cited in Lipton, Bigal, Diamond, Freitag, Reed, et al., 2007). Migraine incidence was found to be highest between the ages of 20 to 24 years of age (18.2 cases per 1000 person-years) among women, and, among men, was highest between 15 and 19 years (6.2 cases per 1000 person-years).

Given the relatively high incidence of migraine and the degree of disability associated with it, economic costs are significant. Research suggests that headache attacks will cause the average migraine sufferer to miss over 4 days of work per year, and a total of 11 workdays per year counting diminished productivity due to working during a headache (Steiner, Scher, Stewart, Kolodner, Liberman, & Lipton, 2003; Schwartz, Stewart, & Lipton, 1997; as cited in Borkum, 2007). Researchers estimate that indirect and direct costs combine to total 10 to 13 billion dollars a year in the United States (Borkum, 2007).

While many migraines’ lives are dramatically improved through the use of pharmacological treatment (Borkum, 2007; Holroyd & Penzien, 1990), there remains a substantial portion of patients for whom preventive pharmacological therapies are ineffective or only partially effective (Borkum, 2007). Given the limitations of existing pharmacological treatments, non-pharmacological treatments for migraine represent an important alternative or supplement to pharmacological treatment—both for treatment of pain and for the accompanying distress. There is evidence to support the use of several kinds of non-pharmacological strategies in the treatment of migraine, including relaxation training, biofeedback, and coping skills training (Gauthier, Ivers & Carrier, 1996; Holroyd & Penzien, 1990). There is also evidence to suggest that combined pharmacological and non-pharmacological treatment results in
significantly better outcomes than pharmacological treatment alone (Holroyd, France, Cordingly, Rokicki, Kvaal, et al, 1995; Borkum, 2007).

The appropriateness of behavioral and psychological treatments for migraine is underlined by research demonstrating that stress and negative mood are associated with maintenance of migraine headache and recurring attacks. Feuerstein, Bortolussi, Houle and Labb (1983) found that state anxiety was elevated four days before an attack. In a time series analysis by Mosley, Penzien, Johnson, Brantley, Wittrock, et al. (1991), elevated stress and daily hassles were associated with greater headache activity three days later. Likewise, laboratory stressors have also been associated with increased headache activity between 2 and 3 days afterwards (Martin & Teoh, 1999). De Benedittis and Lorenzetti (1992) found that participants with tension and migraine headache report more frequent and more stressful daily hassles than controls, and migraine frequency was significantly correlated with daily hassles. A study by Marlowe (1998) found that self-efficacy moderates the relationship between stress and migraine, such that migraineurs with higher self-efficacy are buffered to some extent from the harmful effects of daily hassles. These findings together suggest that treatments designed to help migraineurs appraise daily hassles as less distressing—such as mindfulness training—may make headache attacks less frequent.

**Mindfulness, Pain, and Migraines**

Mindfulness meditation involves the deliberate cultivation of mindfulness, which has been defined as “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally” (Kabat-Zinn, 1990). Mindfulness training in its Western therapeutic forms typically begins with a breathing meditation, in which the practitioner is asked to attend to the physical sensations associated with breathing. Practitioners are instructed to note thoughts,
emotions, and sensations that inevitably disrupt this focus, and then return their attention to the breath. In another type of mindfulness meditation termed the “body scan” technique, participants are asked to sequentially attend to the physical sensations present in each part of the body (Kabat-Zinn, 1990). Other types of mindfulness meditation involve attending to the sensations associated with eating and walking. One unusual technique is to allow an uncomfortable thought or sensation to become the focus of meditation when it is too strong to be ignored, attempting to bring this same accepting, nonjudgmental stance to unpleasant aspects of experience (e.g., as explained in Segal, Williams, & Teasdale, 2002). The idea is that, with regular practice, this mode of consciousness will gradually permeate the practitioner’s life and change the way s/he approaches all aspects of experience.

Mindfulness as practiced in its Western therapeutic context differs in important ways from mindfulness as practiced in a Buddhist context. One perhaps obvious difference is that references to the Buddha are infrequent in therapeutic contexts relative to the Buddhist context, in which training often involves the veneration of the Buddha as the first person to bring this teaching to the world. Veneration of the Buddha and pilgrimages to the sites of his birth and enlightenment (along with eight other locations at which key events in the Buddha’s life occurred) are encouraged in some of the oldest sutras as compatible with mindfulness practice (e.g., Mahaparinibanna sutta; Thanissaro, 2000). Another important difference between Western mindfulness training and mindfulness in the Buddhist context is that, while Western therapeutic forms of mindfulness often focus on modest goals like improving well-being and cultivating active engagement in present moment experience, the Buddhist context construes mindfulness as the means to achieve ultimate enlightenment, or nirvana (Goleman, 1984). As we shall see, however, contrasts between Western “secularized” mindfulness and Buddhist mindfulness
training may be overdrawn—that is, spiritual elements addressed in Buddhist contexts are not entirely absent from Western therapeutic mindfulness training programs. Yet another interesting difference is that, in Buddhist mindfulness training, teachers sometimes encourage meditation on death, one’s own skeleton, or the corpse of a person or animal (e.g., Hanh, 1976/1987; Nyanaponika, 1973). As with spiritual elements of practice, Western therapeutic mindfulness programs have for the most part removed these darker practices from training, while still retaining an emphasis on the impermanence of our lives and of our experiences from moment to moment. While practices focused on death merit investigation, further discussion of this matter is outside the scope of this paper.

Mindfulness-Based Stress Reduction (MBSR) is a relatively widespread and standardized form of mindfulness training which in many ways typifies mindfulness as practiced in a Western therapeutic context. It was developed by Kabat-Zinn to provide mindfulness training to medical patients without overt references to Buddhist spiritual concepts. Initially this program was intended as an adjunct to medical treatment for those dealing with chronic illness and pain. Since that time a growing literature has investigated the utility of MBSR in ameliorating medical symptoms and distress in chronic pain populations. Studies conducted on these populations suggest that MBSR may increase pain tolerance, decrease use of pain medications, increase self-esteem (Kabat-Zinn, Lipworth, & Burney, 1985), decrease fatigue and other medical symptoms (Kaplan, Goldenberg, & Galvin-Nadeau, 1993), mitigate distress associated with pain (Randolph, Caldera, Tacone, & Greak, 1999; Grossman, Teifenthaler-Gilmer, Raysz, & Kesper, 2007), and reduce symptoms of depression and anxiety (Grossman, et al., 2007; Sephton, Salmon, Weissbecker, Ulmer, Floyd, et al., 2007). There is evidence that some of these benefits are maintained at follow-up up two months later (Sephton et al., 2007) and up to four years later.
(Kabat-Zinn, Lipworth, Burney & Sellers, 1986; Grossman, et al., 2007). A recent meta-analysis investigating the impact of MBSR on mental health of adults with chronic medical disease found small effect sizes for decreasing symptoms of depression, anxiety and psychological distress (Bohlmeijer, Prenger, Taal & Cuijpers, 2010).

However, not all findings support the efficacy of MBSR in producing clinically meaningful treatment effects. A randomized-controlled study by Pradhan, Baumgarten, Langenberg, Handerwerger, Gilpin, et al. (2007) found that MBSR did not significantly reduce disease activity in rheumatoid arthritis patients, although there was some improvement in distress and well-being relative to the control group at 4-month follow-up. In a similar study of arthritis patients, mindfulness was found to be superior to CBT and education-only conditions only for patients with a history of chronic depression (Zautra, Davis, Reich, Nicassio, Tennen, et al., 2008). A randomized trial of mindfulness meditation for chronic low-back pain found that MBSR improved physical functioning as measured by the SF-36 relative to a wait-list group, but no significant improvements were found for physical functioning as measured by the Roland Disability Questionnaire or for the pain, physical health and mental health subscales of the SF-36 (Morone, Greco, & Weiner, 2008).

It is also unclear whether mindfulness meditation represents an effective pain management strategy for chronic headaches sufferers specifically, as compared to treatment as usual. In an uncontrolled study of MBSR, Rosenzweig, Greeson, Reibel, Green, Jasser, and Beasley (2010) found no significant reduction in pain among chronic headache sufferers, in contrast to chronic neck/back pain and arthritis patients, who both experienced significant reduction in pain. Also, while all patient groups showed clinically significant improvement in health-related quality of life, effect sizes were smallest among those with chronic headache. In
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sum, while some evidence is promising, it is not yet clear that MBSR reliably yields clinically important improvements in the lives of chronic pain patients, migraineurs in particular.

**Spirituality as an Active Ingredient**

Researchers have attempted to identify the ingredients of mindfulness interventions that are responsible for improvements among persons with chronic pain and/or chronic headaches. One such hypothesized ingredient is physiological relaxation. Since research has shown relaxation strategies to be effective in treating arthritis pain (Morone & Greco, 2007), abdominal pain (Palermo, Eccleston, Lewandowski, Williams, & Morley, 2010), and headache disorders (Gautheir, Ivers, & Carrier, 1996), it is thought that the efficacy of mindfulness interventions for pain may be partly attributed to the physiological relaxation elicited by meditation. Also, there is evidence to suggest that simply attending to bodily sensations, in a manner very similar to the body scan technique of MBSR, induces physiological relaxation and may be as effective in treating chronic headache as more standard behavioral strategies, such as relaxation and/or cognitive therapy combined with biofeedback (Blanchard, Appelbaum, Radnitz, Morrill, Michultka, et al., 1990).

In explaining the effectiveness of mindfulness for pain, researchers also frequently draw parallels between mindfulness training and sensory monitoring, which refers to the dispassionate observation of sensations. Studies have demonstrated that sensory monitoring is often superior to distraction in increasing pain tolerance (Leventhal, 1992; Leventhal, Brown, Shacham, & Engquist, 1979; Ahles, Blanchard & Leventhal, 1983) and/or facilitating faster physiological recovery from cold-pressor pain (Cioffi & Holloway, 1993). Research further suggests that those instructed to monitor painful sensations rather than distract themselves find subsequent stressors less distressing. Based on these findings, researchers have hypothesized that the
strategies chronic pain patients employ to deal with symptoms can have an important delayed impact on their well-being (Cioffi & Holloway, 1993).

A related active ingredient is exposure (Sauer & Baer, 2010; Shapiro, Carlson, Astin & Freedman, 2006). Mindfulness interventions are similar to exposure treatments in that practitioners are instructed to watch thoughts, feelings and sensations closely, even those they find threatening. It is thought that chronic pain sufferers taught this technique will, over time, find their pain less distressing as they repeatedly observe it without “catastrophic consequences” ensuing (Baer, 2003). Others have emphasized the utility of exposure to emotional as well as physical discomfort for chronic pain populations, for whom greater sensitivity to emotions is predictive of more pain, disability and distress (McCracken & Keogh, 2009). That is, as patients are taught to observe negative emotions without reacting to them and without experiencing negative consequences as a result, gradually they will perceive these negative emotions as less threatening, which may subsequently bring about decreases in pain and disability.

Another possible active ingredient of mindfulness interventions is subtle information about the spiritual framework in which mindfulness meditation was originally based (Pargament, personal communication), a possibility which has generally received little attention in the literature. Even when discussing studies which demonstrate increases in spiritual experiences as a result of mindfulness interventions (Carmody, Reed, Kristeller, & Merriam, 2008; Astin, 1997; Shapiro, Schwartz, & Bonner, 1998; Oman, Shapiro, Thoresen, Flinders, Driskill & Plante, 2007; Margolin, Schuman-Olivier, et al., 2007), researchers often construe spirituality as an outgrowth of an ostensibly secular mindfulness practice (e.g., Kristeller, 2007; Carmody, Reed & Kristeller, 2008) rather than describing the spiritual framework as a possible active ingredient in mindfulness training.
However, there are a number of researchers who appear to conceptualize spiritual belief as compatible with mindfulness and leave room for spirituality as an active ingredient in mindfulness training (e.g., Kristeller, 2010; Rosch, 2007; Leary & Tate, 2007). A few researchers even argue that the training context—which often contains spiritual elements—is so important to the construct of mindfulness that it is not meaningful to conceptualize mindfulness as separate from its context (Rosch, 2007; Leary & Tate, 2007). In particular, Rosch argues that mindfulness training does more than simply cultivate a certain kind of attention, but also instructs trainees as to the focus and content of that attention as well. As Rosch explains, classically Buddhism focuses on these three truths—that all is suffering, all is impermanent, and all is devoid of self. While the ultimacy and universality of these truths can give them a spiritual flavor (Pargament, 2007), other teachings are more explicitly spiritual than this. For instance, Buddhist teachers often posit that mindfulness allows practitioners to access the pure loving core—or Buddha nature—that is humankind’s true nature (Gunaratana, 1990; Hart/Goenka, 1987).

The concept of “Buddha nature” is present to some extent even in the “secularized” mindfulness training of MBSR. In *Full Catastrophe Living*, meant to capture for readers the experience of patients attending MBSR at his stress clinic, Jon Kabat-Zinn (1990) echoes Buddhist teachings on the Buddha nature when he discusses a concept he calls wholeness:

No matter how many scars we carry about from what we have gone through and suffered in the past, our intrinsic wholeness is still here: what else contains the scars? None of us has to be a helpless victim of what was done to us or what was not done for us in the past, nor do we have to be helpless in the face of what we may be suffering now. We are also what was present before the scarring, our original wholeness, what was born whole. And we can reconnect up with our intrinsic wholeness at any time because its very nature is that it is always present. So when we make contact with the domain of being in the meditation practice, we are already beyond the scarring, beyond the isolation and fragmentation and suffering we may be experiencing. This means that it will always be
possible to transcend fragmentation, fear, vulnerability, and insecurity, even despair, if you come to see differently, to see with eyes of wholeness. (p. 161)

It appears that, just as in Buddhist mindfulness training, mindfulness as taught in MBSR may be more than just observing experience to find and accept whatever is there, and instead is oriented towards a specific aim or intention—the realization of wholeness. Emphasizing this, Kabat-Zinn tells readers, “perhaps more than anything else, the work in the stress clinic involves helping people to see and feel and believe in their wholeness,” (p. 162). It is important to note that, in both MBSR and Buddhist mindfulness training, intention is not a far-off goal but can become integral to day-to-day practice (Shapiro, Carlson, Astin, & Freedman, 2006), and it is common even in modern Western mindfulness training to begin a period of mindfulness meditation by acknowledging one’s intention.

Incorporation of devotional practices is another way that spiritual elements of the original Buddhist context may become a part of mindfulness training (Rosch, 2007). Buddhist teachers and texts often suggest starting a meditation session by reciting the Threefold Refuge, a devotional practice in which the practitioner reminds him/herself to “take refuge” in the Triple Gem—the Buddha, the Sangha (spiritual community), and the Dharma (teachings) (e.g., Nyanaponika, 1973; Buddhaghosa/Nanamoli, 1979). As another example, Vietnamese mindfulness teacher Thich Nhat Hanh (1976/1987) suggests that, instead of the more common method of counting the length of the breath, one might “measure” the breath using a phrase such as “I take refuge in the Buddha” or “Our father who art in heaven” (the latter phrase is meant for Hanh’s Christian readers; p. 17).

Since devotional elements have been left out of MBSR and other modern Western training programs, how can researchers understand the role of devotional elements in mindfulness training? Are devotional practices merely accumulated ritualization irrelevant to
what mindfulness really is? We have good reason to believe that the answer is no. Western
researchers and mindfulness teachers alike emphasize the importance of the *attitude* one brings
to mindfulness practice, using words like curiosity, openness, acceptance, kindness, compassion,
and patience to describe the quality of attention mindfulness involves (Bishop, Lau, et al., 2004;
Kabat-Zinn, 1990; Shapiro, Carlson, Astin, & Freedman, 2006). The incorporation of devotional
elements into meditation practice suggests that, for some Buddhist mindfulness teachers, this list
of descriptors includes reverence, awe and wonder. In this case, devotional practices are not a
veneer layered over what the essence of mindfulness is. Instead, they represent one way to begin
cultivating the reverential component of mindful attention.

Perhaps this works in a manner similar to the cultivation of loving-kindness (*metta*): in
*metta* meditation, one usually begins by focusing on a natural object of love, such as a dear
friend or family member and then moving on to other targets who may not engender love as
easily, such as a difficult colleague. Likewise a practitioner might begin to cultivate the
reverential aspect of mindfulness by calling to mind objects or circumstances which readily
inspire reverence and then trying to bring this same reverence to more ordinary aspects of
experience. As an example of how the line between mindfulness and reverence can become
blurred, Goldstein and Kornfield (1987) recommend choosing one ordinary activity to focus on
for several weeks as an opportunity to infuse daily living with mindfulness: “Even the simplest
acts can be a powerful reminder to bring a sense of presence and grace. If you choose the
opening of doors throughout the day, you can open each door as if the Buddha himself were to
pass through with you. If you choose the act of making tea or coffee, you can do it as if it were a
gracious Japanese tea ceremony.” (185). Thich Nhat Hanh (1976/1987) makes a very similar
recommendation when he explains to readers what it means to bring mindfulness into daily life:
“I plant with all my heart and mind. I clean this teapot with the kind of attention I would have were I giving the baby Buddha or Jesus a bath. Nothing should be treated more carefully than anything else. In mindfulness, compassion, irritation, mustard green plant, and teapot are all sacred,” (p. 61). Here Hanh clearly privileges the emotion of reverence over the target of the reverence. That is, because of this overlap of mindfulness and reverence, Hanh appears to believe trainees would do well to harness their own spiritual background in service of the cultivation of mindfulness, regardless of whether than background is specifically Buddhist.

Again, even when the overtly spiritual language is dropped (as it is in Western therapeutic contexts) mindfulness teachers encourage practitioners to cultivate emotions akin to reverence, such as awe and wonder, in the course of training (Emmons, 2005). For instance, Gunaratana (1990) encourages practitioners to observe the breath in the following way: “Don’t assume that you know what the breath is. Don’t take it for granted that you have already seen everything there is to see.... Mindfulness looks at everything with the eyes of a child, with a sense of wonder. Mindfulness sees every moment as if it were the first and only moment in the universe. So look again,” (p. 117). Kabat-Zinn demonstrates a similar emphasis on wonder and awe when he asks readers if they’ve ever taken the time to really appreciate how miraculous ordinary things can be, such as a dog or...

a bird, or a cat, or a tree, or a flower, or a rhinoceros?! Any imaginative child could have dreamed up a rhinoceros, or an elephant, or a giraffe. But they didn’t get here as the product of a child’s imagination. The universe is spinning these dreams. They come out of the universe, as do we.

It doesn’t hurt to keep this in mind on a daily basis. It would help us to be more mindful. All life is fascinating and beautiful when the veil of our routinized thinking lifts, even for a moment. The idea is to see the universe as a source of wonder, and likewise to see ourselves and our own experience in the same way.

Correspondingly, in describing his breath meditation, Kabat-Zinn emphasizes learning to see the sensations of breathing as a source of wonder: “When you tune into them [the sensations], you
are reclaiming your own life in that moment and your own body, literally making yourself more real and more alive,” (76). In a meditation script, he asks listeners to “giv[e] themselves over to the bloom of this moment, the fullness of this moment... just this breath coming in, just this breath going out.” (Kabat-Zinn, 2001). These passages show how mindfulness training, even in MBSR, may involve the cultivation of not only curiosity and acceptance, but also awe and wonder. In this way, “secularized” mindfulness training may retain a devotional or reverential flavor even when Buddhist devotional practices are removed.

In summary, mindfulness training—even in its Western therapeutic context—may incorporate spiritual elements in two primary ways. First, training is often directed towards the realization of specific truths about reality (Rosch, 2007), some of which are spiritual in nature. And, second, mindfulness training often involves cultivating a certain quality of attention which may be characterized by reverence and awe in addition to the descriptors more commonly used in the research literature (e.g., acceptance, curiosity, and patience). Therefore, despite efforts to remove spiritual and religious elements from Western therapeutic mindfulness training, it is still appropriate to be curious about the subtle spiritual components of these interventions. Also, given mindfulness teachers’ suggestions that the spiritual elements of practice may enhance adherence and/or directly contribute to a mindful state of consciousness, we have good reason to wonder whether spiritual components of mindfulness training enhance its efficacy for chronic pain populations.

Another reason to suspect that spiritual elements may enhance the effectiveness of mindfulness training is that spiritual engagement may be healing in and of itself, independent of inducing a mindful state of consciousness (Pargament, in press). Three lines of research offer
suggestive evidence that engaging spirituality is helpful to those with chronic pain (Rippentrop, 2005):

1) research showing that many chronic pain sufferers turn to religion and spirituality to cope (Bill-Harvey, Rippey, Abeles & Pfeiffer, 1989; Cronan, Kaplan, Posner, Blumberg & Kozin, 1989; Glover-graf, Marini, & Buck, 2007; Keefe, Affleck, Lefebvre, Underwood, Calwell, et al., 2001);

2) research demonstrating a positive association between religion/spirituality and well-being in other populations (Sawatzky, Ratner & Chiu, 2005; Hackney & Sanders, 2003; Thoresen & Harris, 2002);

3) and cross-sectional studies of chronic pain populations yielding positive associations between measures of spiritual coping and/or spiritual experiences and well-being indicators (Bush, Rye, Brant, Emery, Pargament, et al., 1999; Keefe, et al., 2001; Rippentrop, Altmaier, Chen, Found, & Keffala, 2005).

The author was able to find only two studies which support a causal relationship between spirituality and outcomes among chronic pain population—both randomized controlled trials comparing the efficacy of a spiritual meditation to a non-spiritual meditation. In the first study (Wachholtz & Pargament, 2005) participants were instructed to meditate on a phrase for twenty minutes every day for two weeks, using a technique called mantra meditation, a technique which is distinct from mindfulness meditation. Those in the Spiritual Meditation condition were asked to choose among the following spiritual phrases: God is peace, God is joy, God is good, and God is love. Participants were given the option to choose a term other than God to fit their spiritual beliefs. Those in the Secular Meditation condition were asked to meditate on one of the following phrases: I am content, I am joyful, I am good, and I am happy. Two weeks later, the
Spiritual Meditation group fared better than the secular group on measures of anxiety, positive affect, and existential well-being, as well as tolerating pain for significantly longer on the cold-pressor task. Scores on measures of closeness to God, spiritual experience and mystical experience were also higher for the Spiritual Meditation group relative to the Secular Meditation group at post-test. Non-significant differences between meditation conditions were found for religious well-being as well as reported pain severity and heart rate during the cold-pressor task. Having found that both groups demonstrated significant increases on spiritual variables and decreases in trait anxiety, Wachholtz & Pargament (2005) suggest that participants may experience even secular meditation as somewhat spiritual. Another possibility is that participants naturally turn their attention to the spiritual when they experience greater psychological well-being (Oman, Shapiro, Thoresen, Flinders, Driskill & Plante, 2007).

A second study with a similar protocol found greater efficacy of spiritual meditation over secular meditation in a sample of migraineurs practicing for four weeks, as opposed to healthy volunteers practicing for just two weeks (Wachholtz & Pargament, 2008). Treatment conditions included the above described Spiritual Meditation condition and Secular Meditation condition, this time termed Internal Secular Meditation. Another meditation condition, External Secular Meditation, was added, along with a progressive muscle relaxation condition. In the External Secular Meditation condition, participants were given the following list of phrases to choose from: Grass is green, Sand is soft, Cotton is fluffy, and Cloth is smooth. The Spiritual Meditation group experienced greater reductions in anxiety, headache frequency, and negative affect (findings for positive affect were null, in contrast to above); and greater increases in existential well-being, spiritual experiences, headache-related self-efficacy and pain tolerance. The authors suggest potential mediating factors for these outcomes, including “improved mood,
decreased anxiety, increased self-efficacy, distraction from bodily pain, and/or increased spiritual emotions and support” (p. 364). These results are consistent with other studies on spiritually integrated therapy, which generally suggest that enhancing the spiritual component of an intervention may lead to modestly improved outcomes over the standard intervention (Pargament, 2007).

The Present Study

In light of these findings, this study compared a spiritual mindfulness protocol to a more standard mindfulness protocol and a “relaxation” condition in which participants were asked to sit quietly with their eyes closed. As with Wachholtz and Pargament’s (2008) study, the population under study was migraineurs, and outcomes included pain tolerance and intensity during a cold pressor task, state and trait anxiety, positive and negative affect, headache frequency, headache-related self-efficacy, spiritual well-being, mystical experience, spiritual experience, and awe. In addition, a measure of mindfulness and migraine-related disability/impairment was included. Given research suggesting that sensory monitoring leads to improved pain tolerance (Leventhal, Brown, Shacham & Engquist, 1979; Ahles, Blanchard & Leventhal, 1983), it was hypothesized that both mindfulness groups would demonstrate better pain tolerance relative to the control group, and that, in keeping with Wachholtz and Pargament’s (2005 & 2008) findings, the spiritual mindfulness group would demonstrate better pain tolerance than the standard mindfulness group. As for spiritual variables, it was hypothesized that the spiritual mindfulness group would report a greater increase in scores on measures of spiritual experience compared to the standard mindfulness group and the control group. It was also expected that the spiritual meditation group would experience the greatest increase in headache-
related self-efficacy and the greatest decrease in migraine incidence and migraine-related disability/impairment.
METHOD

Participants

Participants were volunteers recruited on campus and in the local community. Potential participants were screened for circulatory problems such as Raynaud’s disease to avoid potential problems that might be associated with the cold pressor task. In keeping with Wachholtz and Pargament (2005), atheists were be screened out, as the study and measures were appropriate for atheists and agnostics as well.

Migraine Screener

Prior to enrollment, participants were required to pass the ID-Migraine screener (Lipton & Dodick, 2003; see Appendix A). This self-administered screener consists of three questions asking the respondent whether he/she experiences nausea, disability, and light sensitivity during headaches. The respondent indicates “yes” or “no” to each of the items according to his/her experience, and the screener is scored positive when a respondent endorses two of the three items. This screener was validated on a sample of primary care patients presenting for routine office visits who also reported headaches in the past three months (Lipton & Dodick, 2003). After completing the screener, participants were referred to a headache expert who interviewed participants to determine whether they met criteria for migraine diagnosis. Data on the 80% of referred patients who completed the diagnostic interview suggested a sensitivity of 0.81, a specificity of 0.75, and a positive predictive value of 0.93 for the screener. To qualify for participation in the present study, participants will have to report two migraine-type headaches in the past month in addition to scoring positive on the screener. This is in keeping with Wachholtz and Pargament’s (2008) methodology.
Adherence

Participants were required to complete a daily diary with questions assessing adherence to their assigned techniques (see Appendix B). Consistent with Wachholtz and Pargament (2005), those who did not complete the adherence diary on at least 12 out of the 14 days will be dropped from the study. After data collection, inclusion criteria were altered to completion of daily diary on at least 10 of the 14 days, as participants reported intermittent technical problems completing diaries four and five.

Single-item subjective efficacy questions and manipulation check question

Participants were also asked to rate how relaxed they felt when practicing their assigned technique, how helpful they found their assigned technique to be, and the degree to which they felt connected to something sacred during their practice (see Appendix C). The last of these items was considered a manipulation check question—to be sure those in the spiritual mindfulness group on average experienced their technique as more spiritual relative to the other groups.

Measures

Several measures were used to assess the experience of the cold pressor task, migraine severity, psychological symptoms, spiritual experiences, and mindfulness.

**Pain Tolerance.** Prior to and following the intervention, participants completed the cold pressor task. Consistent with Wachholtz and Pargament (2005), a cold water bath was maintained at 2° C, and water was circulated with an aquarium pump to keep temperature uniform throughout the bath. Participants were asked to place their hand in the water bath up to the wrist “until it becomes too uncomfortable” (for script, see Appendix D.) The time that
participants kept their hands in the water was recorded. Also, participants were asked to rate how painful and distressing the task was (see Appendix C).

**Psychological Measures.** Psychological symptomatology and well-being were assessed with self-report measures of affect, anxiety, and depression.

**State Anxiety.** The Spielberger State-Trait Anxiety Inventory (STAI; Spielberger, 1983) consists of twenty items which assess symptoms of anxiety (see Appendix D). Respondents are asked to rate the degree to which they experience these symptoms on a 4-point Likert scale ranging from 1 (not at all) to 4 (very much so). The State scale (10 items) specifies that respondents should refer to what they are currently experiencing in this moment, and the Trait scale specifies that respondents should refer to their experience generally. A recent study of the reliability of the STAI across multiple populations found that, on average, the internal consistency reliability is greater than 0.89 for both the State and Trait scales (Barnes, Harp & Jung, 2002). The state measure yields higher scores among populations one would expect to be more stressed (such as military recruits) relative student samples (Spielberger, 1983). Also, scores on the STAI converge with other anxiety scales, but not so highly that this scale would be redundant (Spielberger, 1983).

**Anxiety Disorder Symptoms.** The Generalized Anxiety Disorder scale (GAD-7; Spitzer, Kroenke, Williams & Lowe, 2006) consists of seven items which assess symptoms of anxiety (see Appendix F G). Respondents are asked to rate the frequency with which they experience these symptoms. There is also an eighth item asking about how difficult these symptoms have made it for respondents to function normally. (In the present study, response to this question is termed “anxiety-related impairment.”) The validation study found this measure to have good internal consistency among patients (alpha = 0.92) and a sample from the general population
(alpha = 0.89; Lowe, Decker, Muller, Brahler, Schellberg, Herzog & Herzberg, 2008). This measure also has good construct validity: higher scores were associated with greater functional impairment and greater likelihood of anxiety disorder diagnosis, as well as higher scores on established measures of anxiety (Spitzer et al, 2006; Lowe et al, 2008). Initial evidence is promising, but sensitivity to change for this scale has yet to be established (Kroenke, Spitzer, Williams, & Lowe, 2010).

**Depression.** The Patient Health Questionaire (PHQ-9; Kroenke, Spitzer & Williams, 2001) is a short self-report measure of depressive symptoms (see APPENDIX HAppendix G). It consists of nine items describing symptoms of depression. Respondents are asked to rate the frequency with which they experience these symptoms. There is also a tenth item asking about how difficult these symptoms have made it for respondents to function normally. (In the present study, response to this question is termed “depression-related impairment.”) The validation study demonstrated that, in patient samples, this scale has good internal consistency (alphas from 0.86 to 0.89), and test-retest reliabilities (48 hours) were around 0.84 (Kroenke et al, 2001). Higher scores on this scale were associated with lower functioning and greater symptom-related difficulty, days of work missed for illness and use of health-care. This measure has also been shown to be sensitive to change (Lowe, Kroenke, Herzog & Grafe, 2003) as well as suitable for detecting sub-threshold depression in the general population (Martin, Rief, Klaiburg, & Braehler, 2006).

**Headache-specific Measures.**

**Diary Measure.** Participants recorded their headache frequency as well as pain severity, disability, and distress associated with headache in their daily diaries. They were also be asked to rate their general mood on that day. See Appendix B for the diary.
**Self-efficacy.** The Headache Management Self-Efficacy Scale (HMSE; French, Holroyd, Pinell, Malinoski, O’Donnell, *et al.*, 2000) assesses a respondent’s belief that he/she can effectively prevent or manage the pain, disability and distress associated with headaches (see APPENDIX IAppendix H). It consists of 25 items rated on a 7-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Examples of items include “I can prevent headaches by changing how I respond to stress” and “I can do things that will control how long a headache lasts.” Data on a sample of patients seeking treatment for headache indicated an internal consistency estimate (Cronbach’s alpha) of 0.90 (French, Holroyd, Pinell, Malinoski, O’Donnell, & Hill, 2000). The measure was correlated in predicted ways with a measure of headache severity and frequency, a measure of headache-related disability, and subscales of Headache-Specific Locus of Control Scale

**Headache Impact.** The Headache Impact Test—6-item version (HIT-6; Kosinski, Bayliss, Bjorner, Ware, Garber, *et al.*, 2003; see Appendix I) was developed from the computer-based HIT, which uses Item Response Theory to generate an accurate score in less than 5 questions pulled from a pool of 54 total items. Developers of the HIT-6 chose six items of the 54 total items as most representative of the overall score. These items assess pain severity, role limitations due to headache, and distress due to headache. The validation study demonstrated that the HIT-6 has good psychometric properties, including an internal consistency reliability of about 0.90 and a two-week test re-test reliability of 0.80 (Kosinski, *et al.*, 2003). Supporting construct validity, HIT-6 scores were found to correlate well with a generic measure of health-related quality of life. Also, respondents reporting an increase in headache activity over the course the study demonstrated significant increases in their HIT-6 score, and vice-versa for those reporting a decrease in headache activity. Those reporting no change likewise showed no
significant differences in HIT-6 scores on average. A study comparing HIT-6 scores to a 4-week diary measure found a high correlation between the two, supporting the utility of the HIT-6 in assessing headache disability (Shin, Park, Kim & Lee, 2008).

**Spirituality Measures.**

**Religious Demographics.** As in Wachholtz and Pargament (2008), participants will be asked to provide their religious affiliation, frequency of attendance at religious services, and frequency of prayer/religious meditation. Two items assessing self-rated religious and spiritual intensity will be used as well. These items are from the Brief Multidimensional Measure of Religiousness/Spirituality (BMMRS; Fetzer, 1999). Data collected from 1997-1998 as a part of the General Social Survey yielded an alpha of 0.77 for the religious/spiritual intensity items (Fetzer, 1999). See Appendix J.

**Spiritual Experiences.** The Daily Spiritual Experiences Scale (DSES; Underwood & Teresi, 2002) consists of 16 items, 15 of which describe a particular spiritual experience and prompt the respondent to rate the frequency of that experience (see Appendix K). The 16th item asks how close the respondent feels to God, in order to “calibrate” answers to the 15th item, which assesses longing for the divine. The measure as it was originally developed uses a 6-point Likert scale from 1 (*many times a day*) to 6 (*never or almost never*) for the first 15 items, but in order that higher scores indicate more spiritual experiences, frequently the Likert scale is inverted. The current study will use the inverted Likert scale. Many of the items in the DSES use the word God, and respondents are instructed at the beginning of the measure to substitute a more comfortable word if the word God does not capture what is sacred or divine to him/her. A subset of 6 items (which are highly correlated with the overall scale score) was found to have an internal consistency reliability of 0.64 (Underwood & Teresi, 2002). Wachholtz and Pargament
(2008) reported internal consistency reliabilities of 0.92 to 0.93 for the full 16-item measure among a sample of migraines. For the purposes of this study, the instructions were altered slightly, asking respondents to refer to their experience over the “past few weeks” when filling out this questionnaire.

The Mysticism scale (M scale; Hood, 1975; see Appendix L) consists of 32 items developed to reflect criteria of mystical experience proposed by Stace (1960). A factor analysis of the original validation sample yielded two factors—a general mystical experience factor and a religious interpretation factor (Hood, 1975). A later study with a larger sample size found three factors—extrovertive mysticism, introvertive mysticism, and religious interpretation (Hood, Morris & Watson, 1993). Internal consistency alphas for each of these subscales were 0.76, 0.69, and 0.76. Higher scores have been shown to correlate with intrinsic religious orientation and openness to experience (Hood, 1975). Generally M scale scores have not been found to correlate with measures of psychopathology (Burris, 1999).

**Awe.** The Engagement with Beauty Scale (EBS; Diessner, Solom, Parsons, Frost & Davidson, 2008) measures individual differences in the experience of awe towards beauty in nature, in art, and in others’ moral actions (see Appendix M). In a sample of college students, the scale was found to have good internal consistency reliability (Cronbach’s alpha, 0.90; Diessner, *et al.*, 2008). Scale scores were correlated with measures of gratitude and spirituality, supporting the scale’s construct validity. For this study, items of the EBS will be adjusted in order to make them closer in kind to items of the Daily Spiritual Experiences Scale. That is, instead of an item reading “When perceiving beauty in nature I feel changes in my body, such as a lump in my throat . . . [etc.],” it will read, “I experience beauty in nature so intensely that I feel changes in my body . . . [etc.].” The Likert scale will also be changed: instead of an 8-point
scale ranging from 0 (very unlike me) to 7 (very much like me), a 6-point scale will be used, ranging from 1 (never or almost never) to 6 (many times a day). Also, as with the DSES, respondents were asked to refer to their experience over the past few weeks.

**Mindfulness.** Cultivation of mindfulness over the two weeks of the study was assessed with two self-report measures of mindfulness—one measuring dispositional mindfulness and another measuring “state-like” mindfulness.

**Dispositional Mindfulness.** The Mindful Attention and Awareness Scale (MAAS; Brown & Ryan, 2003) was developed to assess attention to present-moment experience, including such items as “I could be experiencing some emotion and not be conscious of it until some time later,” and,” I rush through activities without being really attentive to them” (see APPENDIX QAppendix N). Respondents rate the frequency of their experience of an item on 6-point Likert Scale from 1 (almost always) to 6 (almost never). All items are phrased indirectly such that higher frequency indicates less mindfulness. The original item pool did contain some direct statements reflecting mindful attention rather than a lack of it, but Brown and Ryan (2003) dropped them after factor analysis indicated very low loadings for these items. The current MAAS was found to have an internal consistency alpha of 0.82 in a sample of college students and an alpha of 0.87 in a national sample of adults (Brown & Ryan, 2003). In this same sample, four-week test-retest reliability was found to be 0.81; Also, the MAAS scale demonstrated convergent validity with another mindfulness scale ($r = 0.31$ to 0.33) and a measure of emotional intelligence ($0.37$ to 0.46). As the authors point out, however, these correlations are low enough that the MAAS can be said to measure a construct distinct from what these other scales are measuring. Also supporting the construct validity of the scale, higher MAAS scores were found to predict higher concordance between measures of implicit and explicit affect. There is
evidence that the MAAS is sensitive to change, in that scores increased after a mindfulness intervention. Further, greater increases in MAAS scores were associated with greater decreases in measures of psychopathology after controlling for changes in fatigue and pain (Brown & Ryan, 2003).

**State Mindfulness.** The Toronto Mindfulness Scale (TMS; Lau, Bishop, Segal, Buis, Anderson, et al., 2006) was developed as a measure of mindfulness as experienced over a very short period of time—that is, “state” mindfulness (see Appendix O). It consists of 13 statements referring to the respondent’s meditative experience just beforehand. Respondents rate their level of agreement with each of these statements on a Likert-type scale from 0 (not at all) to 4 (very much). The items load on two factors: a Curiosity factor, which reflects the degree to which a respondent maintained a sense of curiosity towards thoughts, feelings and sensations, and a Decentering factor, which reflects how much the respondent was able to maintain a sense of self as independent of his/her thoughts/experiences. In a sample of 165 participants recruited from the community (Lau, et al., 2006), Decentering scores were found to correlate significantly with absorption, openness to experience, and reflective self-awareness. Curiosity scores were correlated significantly with absorption and reflective self-awareness. Neither subscale was correlated significantly with ruminative self-awareness. Correlations were small to moderate, supporting the discriminant validity of the TMS. Also supporting construct validity, scores were also found to be higher among respondents with more mindfulness meditation experience. As for sensitivity to treatment, scores increased significantly among patients participating in MBSR. Increases in Decentering scores mediated decreases in a measure of perceived stress.

**Procedure**
To recruit participants, fliers were posted around campus and the local community, and the study was posted to the computer system that the university uses to advertise studies and to assign research participation credits (required for psychology classes). Advertisements described the present study as a study of meditation and relaxation techniques for people with headaches. See Appendix P for recruitment materials.

Research assistants were not kept blind to the study protocol. They were trained by the principal investigator prior to the start of the study to teach relaxation/meditation sessions and run the cold pressor task. Research assistants were assigned to teach sessions in a balanced manner—such that each assistant teaches the same number of sessions for each of the three treatment groups. Research assistants running the cold pressor task were kept blind to each participant’s assigned condition. Participants met in groups of two to ten for pretest questionnaires and initial instruction in their assigned technique. At the beginning of this first meeting, the study protocol was explained to participants, and, after answering questions, research assistants asked willing participants to sign the informed consent. Then participants will completed a survey packet (Packet 1) consisting of general demographics, religious demographics, PHQ-9, DSES, HIT-6, and HMSE. Once all participants completed these questionnaires, they were assigned to one of three groups with a random number generator: spiritual mindfulness, regular mindfulness, and relaxation. At that point the groups were separately trained in their assigned technique and told to practice their assigned technique for 20 minutes a day for the next two weeks. See below for details on training sessions for each group. Participants also received a handout outlining their assigned technique (see Appendix S, Appendix U, Appendix W, AD.). In order to ensure that participants practiced the technique as it was taught, they were instructed to look over their handouts just prior to each of the first three
meditation sessions. Participants were also given an adherence/headache diary to be completed daily, and an appointment was scheduled for two weeks later for them to complete post-test questionnaires and the cold pressor task.

After two weeks of practice, participants returned individually to their respective post-test appointments. Participants were instructed to practice their assigned technique for 20 minutes, and then to complete the cold pressor task while still meditating (see Appendix D for script). Afterwards, participants completed Packet 2, consisting of manipulation check questions, the TMS, GAD-7, STAI, PHQ-9, HMSE, DSES, M scale, EBS, and MAAS. See Appendix Q2 for an outline of procedures.

**Meditation/Relaxation Training.** Each group was read an introduction that provides a rationale and brief description of the assigned technique. Then participants were led in practicing their technique for five to seven minutes. The relaxation/meditation scripts used to lead the participants in practicing the technique were designed to be similar in structure—first asking participants to recall their intention (which differs depending on group), then providing more specific guidance in their technique, followed by a period of silence. Instructions for each of the three groups was as follows (see Appendix R, Appendix T, and Appendix V).

**Relaxation group.** The rationale given in the relaxation group’s introductory script was that, as research suggests, this technique may improve pain tolerance and well-being in the long term, and in the short term, may help them relax and restore themselves. After providing the rationale, the technique was described as simply “sitting quietly with your eyes closed, relaxing your muscles and calming your mind.” Then, the guided meditation began, asking participants to recall their intention (“to quiet your mind and restore yourself”) and instructing participants to “relax your body, releasing tension from your muscles,” to “let your worries and
concerns fall away, and let your mind grow calm.” This was followed by a period of silence, until a total of five minutes passed since the start of the meditation.

Mindfulness groups. The scripts for the introduction and the meditation scripts for the spiritual and regular mindfulness groups were designed to be equivalent in length and parallel in content and were pilot-tested for equivalence in positive valence. The meditation scripts were based on a mindfulness-of-breathing script used by Arch and Craske (2006), adapted from Segal, Williams, and Teasdale (2002). Note that, while they gently encourage a certain frame of mind, both the spiritual and regular mindfulness scripts emphasized acknowledgment and acceptance of unpleasant thoughts, feelings and sensations as key to the technique. These scripts were significantly longer than that of the relaxation group, but the total practice time was similar—six to seven minutes.

Regular Mindfulness. As with the relaxation group, the regular mindfulness introductory script begins by explaining that research suggests this technique may improve pain tolerance and well-being in the long term. The introductory script for regular mindfulness continues, saying the practice is aimed at “becoming more engaged in your experience in this very moment,” which is in contrast to the relaxation introductory script, which merely posits feeling relaxed and restored. The script continues by describing how often we worry about the future or ruminate about the past instead of staying in touch with present moment experience. The script then explains basics of the technique (i.e., focusing on the breath). Then a rationale is given for the focus on the breath by commenting on its calming rhythm, and the way the breath may serve to remind us of “the vitality and inner calm” that is with us wherever we go. The introductory script closes with a metaphor adapted from Kabat-Zinn (2001) which compares this practice to dropping underneath the ocean’s choppy surface to more peaceful waters below, “where you
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may find a sense of calm and clarity even in times of stress, and grow closer to who you are.”
This is meant to reflect a secularized interpretation of Kabat-Zinn’s (1990) concept of wholeness.

After this introduction, participants were led in practicing their meditation for a total of
ten minutes (as in the relaxation group). In contrast to the relaxation scripts’ emphasis on simply
quieting the mind as the intention, the guided meditation script for the regular mindfulness
condition begins by reminding the listener of his/her intention to become more engaged in the
present and “to learn to access a sense of calm in ordinary, everyday experiences.” The script
continues by instructing the listener to closely monitor sensations associated with breathing,
noting what is on the mind when it wanders. Listeners are then reminded to think of the breath
as representing a source of calm, focus, and energy. The meditation concludes by referencing
the ocean metaphor described above, asking listeners to see if they can “begin to settle into a
sense of calm and clarity, all around you, moving through you, with every breath in, and every
breath out.” See Appendix T for script.

Spiritual Mindfulness. For the spiritual mindfulness group, the introductory script begins
by framing the practice as aimed at cultivating spiritual connection, “a sense of becoming more
fully alive in this very moment, feeling that you are closer to something within and around you,
something more fundamental or sacred.” The script continues by briefly describing the spiritual
background of the technique they are about to learn, explaining what the technique will be like
(i.e., focused on the breath) and then elaborating on the connection between breath and
spirituality across traditions. As in the regular mindfulness condition, the introduction ends with
the metaphor adapted from Kabat-Zinn (2001) which compares this meditative technique to
dropping underneath the ocean’s surface, “where we may grow closer to a vast and sometimes
wondrous reality that is always with us, even when we are not aware of it.” This is meant to reflect a more explicitly spiritual interpretation of Kabat-Zinn’s notion of “wholeness.”

The guided meditation script for spiritual mindfulness begins by reminding the listener of the spiritual intention of the techniques and then instructs him/her in closely monitoring sensations associated with breathing, noting what is on the mind when it wanders. Listeners are then reminded of the spiritual significance of the breath. The meditation concludes by asking listeners to see if they can sense “something or someone greater than yourself, something really real, all around you, moving through you, with every breath in and every breath out.” See Appendix V for script.

**Statistical Analyses**

All data analyses were conducted using SPSS. The three treatment groups were tested (1 x 3 ANOVAs) for significant differences on the variables measured in Packet 1 (general demographics, religious demographics, HIT-6, HMSE, DSES, and PHQ-9). Pearson correlations were calculated to test for associations between pre-test variables and outcomes variables. Analysis included testing for interactions between pre-test variables and treatment outcomes of each group. Variables found to differ significantly between groups at pre-test were controlled for in 1 x 3 ANCOVAs conducted for all variables measured at post-test. The diary measures were tested for a time X group interaction. Repeated measures ANOVAs (2 x 3) were conducted for variables measured at pre- and post-test (DSES, PHQ-9headache impact).
RESULTS

Analytic Plan

Preliminary Analysis. Preliminary analyses were run to assess attrition, adherence to meditation/relaxation regimen, and sample characteristics, as well as addressing whether the spiritual version of mindfulness was perceived by participants as more spiritual and examining correlations between key pre- and post-test variables.

Attrition and adherence to meditation/relaxation regimen. Completion of the study was defined as completion of post-test as well as at least ten daily diaries. Attrition rates were calculated by comparing those who had attended initial training and did not complete the study as defined, to the subset who completed the study as defined. Subsequent three-way ANOVAs by condition were run to test for differences in attrition rates. T-tests were used to compare means of pre-test variables for those who completed the study and those who did not. Using data from completers only, three-way ANOVAs by condition were run to test for between-condition differences in total reported meditation time and to assure that, as intended, each research assistant trained roughly equal numbers of participants in each condition. All subsequent analyses were conducted using data from study-completers only.

Pre-test completer characteristics. Means and standard deviations were calculated for all continuous pre-test variables for participants who completed the study. Frequencies were calculated for categorical variables. Three-way ANOVAs by condition were run to test for differences between conditions at pre-test. Any variables found to differ significantly between groups were noted so that they could be accounted for in analyses of the effects of condition.

Spirituality manipulation check. To assess whether spiritual mindfulness condition was experienced as more spiritual than the other conditions, participants were asked to rate (on a
likert-type scale) the frequency with which they experienced the sacred as they practiced their assigned technique. This rating—labeled “connection to sacred”—was used as a manipulation check variable rather than a dependent measure.

**Correlation matrix for key pre and post-test variables.** To provide an initial picture of the relationships between mindfulness and spirituality in this study, bivariate correlations were computed to test for associations between demographic variables (gender, ethnicity), spiritual/religious-background variables (self-rated religiousness, self-rated spirituality, denomination, prior meditation experience, belief in God), and key outcome variables (connection to sacred, cold-pressor-related variables, mindfulness variables, and spirituality-related variables). Categorical variables were converted to sets of dichotomous variables to allow for inclusion in the correlation matrix.

**Analyses of the Effects of Condition.** Three types of analyses were done for variables measured only at post-test (termed post-only variables), variables measured at both pre- and post-test (termed pre-post variables), and variables measured in daily diaries over the course of the study (diary variables). For post-only variables, three-way ANOVAs were conducted to test the effect of condition, with any variables found to differ significantly between groups at pre-test also included in the model as covariates. Variables measured only at post-test were: pain tolerance (time in water in minutes), subjective stressfulness of cold-pressor task, subjective pain experienced during the cold pressor task, state anxiety, anxiety disorder symptoms (GAD), anxiety-related impairment (GAD-impair), trait mindfulness (MAAS), state mindfulness (TMS), awe of nature (EBS), mysticism (M-scale), as well as subjective relaxation (how relaxing what your assigned technique?), subjective helpfulness (how helpful was your assigned technique?),
and reported fit with spirituality (how well did your assigned technique fit with your spirituality?).

For pre-post variables, ANOVAs were conducted to test for main effect of time and condition-by-time interactions, again with any variables found to differ significantly between groups at pre-test also in the model as covariates. Dependent variables measured at pre- and post-test were Headache Management Self-Efficacy (HMSE), Depression (PHQ), Depression-related impairment (PHQ-impair), and Daily Spiritual Experiences (DSE). For post-only variables and pre-post variables, Least Squares Difference post-hoc tests were used to test for significant differences between pairs of conditions (regular mindfulness and spiritual mindfulness; regular mindfulness and simple relaxation; and spiritual mindfulness and simple relaxation). Note that post-hoc tests were examined regardless of the significance of the overall F statistic for effect of condition.

For the diary variables, ratings for days 0 through day 3 were averaged together to yield a time 1 rating, ratings for days 4 through 8 were averaged together to yield a time 2 rating, and days 9 through 13 were averaged together to yield a time 3 rating. These daily diary variables were average head pain, number of headaches reported, positive mood, negative mood, headache-related impairment, and headache related distress. ANOVAs were conducted to test for a main effect of time as well as time-by-condition interactions, again including in the model any variables found to differ significantly between conditions at pre-test. Results of analyses for diary variables yielded no significant effect of time and no significant time-by-condition interactions. For this reason, results regarding daily diary measures are not reported here.

**Exploratory Tests for Moderation of Condition Effects.** All significant effects of condition and significant interactions between condition and time were then tested for
moderation using ANOVA. As these analyses were considered exploratory, all the following
pre-test variables were tested as moderators: age, gender, ethnicity, headaches per month,
headache impact, headache management self-efficacy, depression, depression-related
impairment, denomination, prior meditation experience, service attendance, prayer, belief in
God, self-rated religiousness, and self-rated spirituality. Total reported meditation time was also
tested as a moderator because it serves an index of adherence. To enable testing for moderation
by continuous pre-test variables, continuous pre-test variables were converted to categorical
variables by ordering cases and grouping them into thirds—low, medium, and high. (Note that
non-significant effects of condition were tested for moderation as well, but, with few exceptions,
no clear patterns emerged. For this reason, results of moderation analyses of non-significant
effects or interactions are not reported here.)

For post-only variables, potential moderators were considered significant moderators
when the F statistic for the interaction term was significant at the 0.10 level and at least one post-
hoc test was significant at the 0.05 level. For pre-post variables, potential moderators were
considered significant moderators when the three-way interaction term—variable by condition
by time—was significant at the 0.05 level and at least one post-hoc test was significant at the
0.05 level. Post-hoc tests were conducted by creating a separate data sets for participants
endorsing different values of moderator in question (for instance, low, medium and high
frequency of service attendance), running an ANOVA to test for the effect of condition in each
of these data sets, and, for each of these data sets, conducting Least Squares Difference post-hoc
tests to test for significant differences between pairs of conditions (regular mindfulness and
spiritual mindfulness; regular mindfulness and simple relaxation; and spiritual mindfulness and
simple relaxation).
Preliminary Analyses

Attrition and Adherence to Meditation/Relaxation Regimen. A total of 108 participants attended initial training. Seventy-four participants completed the study as defined above (completing post-test and at least 10 of the 14 daily diaries)—22 in the regular mindfulness condition, 27 in the spiritual mindfulness condition, and 25 in the simple relaxation condition. There were no significant differences in attrition rates between conditions. Completers did not differ significantly from the original sample except in age: completers were younger than non-completers (p = 0.014). Average total reported meditation/relaxation time for completers was 189.8 minutes—about 72% of the 260 minutes they were assigned. Reported adherence to the meditation/relaxation regimen did not differ systematically by condition. Analyses of completers confirmed that research assistants trained roughly equal numbers of participants in the three conditions.

Pre-test Sample Characteristics. Pre-test frequencies, means and standard deviations for completers are reported in Table 1, sorted by condition. The only variable that differed significantly between conditions at pre-test was ethnicity. To allow for simpler ANOVAs, white ethnicity was chosen as a dichotomous indicator variable for ethnicity, as both whites and non-whites were present in each condition. White ethnicity was then included in the model whenever effect of condition was tested. (Note that differences between endorsement of a particular level of spirituality and a particular type of prayer were also different between groups at pre-test. However, F statistics for overall differences between conditions for spirituality and prayer were not significant. For this reason, spirituality and prayer were not accounted for in subsequent analyses of effect of condition. This also allowed for simpler interpretation of ANOVAs.)
**Spirituality Manipulation check.** Connection to sacred was found to be significantly greater in the spiritual mindfulness group relative to the simple relaxation group at the 0.05 level and relative to the regular mindfulness group at the 0.10 level, as summarized in Table 1.

**Correlation Matrix for Key Pre- and Post-test Variables.** Bivariate correlations between connection to sacred, pre-test demographics, religious background variables, and key outcomes variables yielded some information regarding the relation between spirituality/religion and mindfulness in this study (see Table 2). State mindfulness (TMS) was found to correlate positively and significantly with self-rated religiousness ($r = 0.26$), daily spiritual experiences at post-test ($r = 0.31$), and connection to the sacred during practice ($r = 0.41$). TMS was also significantly associated with religious affiliation: Christian religious affiliation (dichotomized such that Christian was set at 1 and any other affiliation was set at 0) significantly predicted greater TMS scores ($r = 0.29$), while endorsement of either atheist, agnostic, or no affiliation (also dichotomized such that atheist, agnostic, or no affiliation was set at 1 and any other affiliation was set at 0) significantly predicted lower TMS scores ($r = -0.34$). TMS was not significantly related to belief in God. Trait mindfulness (MAAS) was found to correlate significantly and negatively with state anxiety ($r = -0.32$), but was not significantly related to any other variables tested here. Taken together, these results suggest that religious affiliation and connection to the sacred during practice are related to greater state mindfulness during practice; these relationships do not hold for trait mindfulness.

**Analyses of the Effects of Conditions**

**Post-only Analyses.** To test for the effect of condition, three-way ANOVAs were conducted for each dependent variable. Among the outcome variables measured only at post-test, two yielded statistically significant results: subjective stress experienced during the cold
pressor task (cold pressor stress) and state mindfulness (TMS), (see Table 3). For reference, values for connection with sacred during practice are also provided in Table 3. See Table 4 for F-statistics and degrees of freedom for overall effect of condition, as well as difference scores and significance for post-hoc tests.

*Cold pressor stress.* The spiritual mindfulness and regular mindfulness groups rated the cold pressor task as significantly less stressful than the simple relaxation condition \( (p = 0.026 \text{ and } 0.034 \text{ for regular mindfulness and spiritual mindfulness, respectively}) \). The difference in cold pressor stress was not significant for the post-hoc comparison between spiritual mindfulness and regular mindfulness condition.

*State Mindfulness (TMS).* The spiritual mindfulness group reported greater state mindfulness relative to the regular mindfulness group \( (p =0.004) \) and relative to the simple relaxation condition \( (p = 0.03) \). These significant effects held for the two sub-scales that make up the TMS—curiosity and decentering. That is, the spiritual mindfulness group reported both greater curiosity and a more pronounced sense of being decentered from their thoughts and feelings relative to the other groups.

*Non-significant results.* No significant results were found at post-test for time in water, pressor pain, state anxiety just after cold pressor, anxiety disorder symptoms (GAD7), anxiety-related impairment, trait mindfulness (MAAS), awe of nature (EBS), mysticism (M-scale), subjective helpfulness, subjective relaxation, and self-reported degree of fit between technique and participants’ own spirituality.

*Pre-post Test Analyses.* A significant effect of time was found for all four pre-post measures—that is, participants demonstrated significant improvement on all measures taken at
pre- and post-test. No significant condition-by-time interactions were found. A summary of these results can be found in Tables 5 and 6.

**Moderator Analyses.** Interpretable moderation of the effect of condition emerged for two moderators: self-rated religiousness and headache management self-efficacy as pre-test. Age, ethnicity, headache impact, depression, depression-related impairment, denomination, prior meditation/relaxation experience, service attendance, prayer, belief in God, self-rated spirituality, and total reported meditation did not significantly moderate condition effects.

**Moderators of the effect of condition on cold pressor stress.** No significant moderators were found.

**Moderators of the effect of condition on state mindfulness (TMS).** Those who reported being “not religious at all” reported higher state mindfulness (TMS) at post-test in the spiritual mindfulness condition relative to the other conditions, while effect of condition was not significant for those who reported being slightly, moderately, or very religious—see Figure 1 and Table 7. Headache management self-efficacy (HMSE) also emerged as a moderator of state mindfulness at post-test, but the patterns of these findings are difficult to interpret: those with high and low HMSE benefited (with regard to state mindfulness) more from the spiritual mindfulness condition, while those with intermediate HMSE benefited equally across conditions—see Figure 2 and Table 7.
DISCUSSION

While effective pharmacological treatments exist for migraine, there remain significant numbers of migraineurs who continue to struggle with their condition, either because medication is incompletely effective or because side effects of headache medication make pharmacological management of headache unappealing. The inadequacy of pharmacological solutions, along with empirical evidence for effectiveness of behavioral treatments for migraine, make behavioral treatment an important substitute for or adjunct to pharmacological treatment. One type of behavioral treatment that has received increasing attention in the literature is mindfulness meditation, though the spiritual content and means of action of this technique is under-explored. Previous studies of other types of meditation have demonstrated that spiritual meditation provides significantly greater benefits than secular meditation (Wachholtz & Pargament, 2004 & 2008). This study sought to replicate these findings with mindfulness, while also examining whether spirituality may enhance mindful awareness. In general, the findings provide partial support for the efficacy of a brief mindfulness training over a generic relaxation script, and partial support for the incremental efficacy of adding an explicit spiritual component to this training. The results of this study are discussed in detail below. For each outcome domain, findings comparing mindfulness conditions to the basic relaxation condition are discussed first, followed by findings comparing the spiritual mindfulness and regular mindfulness conditions to each other.

Pain

Mindfulness Meditation vs. Simple Relaxation. Pain variables analyzed in this study centered around the cold pressor task: pain tolerance during the task (time in cold water bath), reported stressfulness of the task, and reported pain experienced during the task. Of these three,
only reported stressfulness of the task differed significantly between groups: the mindfulness groups found the task significantly less stressful than participants in the basic relaxation condition. These modest findings for the cold pressor task are generally consistent with findings of studies of brief mindfulness or sensation-focused interventions, which yield somewhat better outcomes relative to distraction and other pain management strategies (Keogh, Hatton, & Ellery, 2000; Liu, Wang, Chang, Chen, & Si, 2012; Nouwen, Cloutier, Kappas, Warbrick, & Sheffield, 2006).

**Spiritual Mindfulness vs. Regular Mindfulness.** In contrast to results of studies by Wachholtz and Pargament (2005 & 2008), the spiritual meditation condition did not lead to significantly better pain tolerance relative to the non-spiritual conditions in this study—regular mindfulness and basic relaxation. This study differs from studies by Wachholtz and Pargament (2008) in a few ways which could account for differing results regarding pain tolerance. First, it could be argued that, compared to the spiritual meditation of this study, the spiritual nature of the meditation was more salient in studies by Wachholtz and Pargament (2005, 2008), as participants were instructed to meditate on a phrase such as “God is love” or “God is peace” (though they were given the option to substitute word that better fit their spirituality if “God” did not resonate with them). It is challenging to incorporate spiritual content into a mindfulness script in a manner that is both maximally relevant and sensitive to theistic and non-theistic spiritual beliefs. In part for this reason, participants were asked to rate the frequency with which they felt connected to something sacred during their practice. Analysis of responses to this item suggest that the spiritual mindfulness condition may not have been experienced as significantly more spiritual than the regular mindfulness condition, as the spiritual mindfulness condition was experienced as more sacred than the regular mindfulness condition at the 0.10 rather than 0.50
level. Part of the difficulty here is not specific to this study but inherent to any effort to create a strictly non-spiritual intervention, as studies show people tend to inject spiritual material into secular interventions (Rye, Pargament, Pan, Yingling, Shogren & Ito, 2005; Wachholtz & Pargament, 2005 & 2008).

A second important difference between this study and those of Wachholtz and Pargament (2005 & 2008) has to do with controlling for the positive tone of the spiritual condition. For the present study, regular and mindfulness scripts were deliberately balanced with positive tone in mind and found to not differ significantly in positive tone in pilot testing. In contrast, Wachholtz and Pargament (2008) did not to carefully control for positive tone. More specifically, in one of the secular meditation conditions, phrases participants could choose from included “grass is green,” “sand is soft,” “cotton is fluffy,” and “cloth is smooth,” which are arguably more neutral in tone than the phrases the spiritual meditation participants were instructed to choose from – “God is peace,” “God is joy,” “God is good,” “God is love.” In this case, some of the benefit derived from the spiritual condition might be attributed to positive tone. (Note that this concern about positive tone and the above-mentioned concern regarding salience of spiritual content are applicable to all of the findings in this study, not just the pain results.)

A third difference has to do with the blinding of experimenters. In the present study, experimenters running the cold pressor task were blinded to the condition of each participant, as is typical in other cold pressor studies (e.g., Hayes, Bissett, Korn, Zettle, Rosenfarb, et al., 1999; Liu, Wang, Chang, Chen, & Si, 2012). In contrast, experimenters in studies by Wachholtz and Pargament (2005 & 2008) were blinded to study hypotheses but not to condition. A pro-spiritual bias on the part of experimenters could have influenced those in the spiritual condition to behave differently from those in the secular conditions. Arguably study findings of Wachholtz and
Pargament (2008) remain ecologically valid even if experimenter bias affected results, since, practically speaking, many people have a pro-spiritual bias and caregivers for pain patients may be able to offer interventions in a manner more likely to elicit improvement in symptoms if the intervention matches their own spiritual beliefs.

A fourth potentially important difference is that Wachholtz and Pargament (2005 & 2008) used mantra meditation instead of mindfulness meditation. It may be that mantra meditation is better suited to abbreviated training than is mindfulness meditation (Carhart & Feuille, 2012).

**Mental Health**

**Mindfulness Meditation vs. Simple Relaxation.** Results show that all groups experienced a significant decrease from pre-test to post-test in depressive symptoms and headache-management self-efficacy, but there were no significant differences between conditions in improvement on these measures, and no significant differences in post-test only measures of mental health (state anxiety, anxiety disorder symptoms, subjective relaxation, and subjective helpfulness). This runs counter to a recent meta-analysis of Mindfulness-Based Stress Reduction (MBSR), which found that, compared to no-treatment control groups, MBSR led to improvement in depression symptoms, albeit with a small effect size (– 0.26; Bohlmeijer, Prenger, Taal, & Cuijpers, 2010). Recall that MBSR is an eight-week treatment program and involves eight to twelve hours of instructions. In retrospect it may have been unlikely that significant differences would emerge between the simple relaxation condition and the mindfulness conditions for mental health variables, given that the treatment in this study was very brief by comparison and that the comparison group was given basic relaxation training rather than no treatment.
Spiritual Mindfulness vs. Regular Mindfulness. While lack of significance between the basic relaxation and mindfulness conditions may not be anomalous with regard to mental health variables, it is more difficult to explain why significant differences were not found between the spiritual and regular mindfulness meditation groups. Recall that Wachholtz and Pargament (2005 & 2008) found that spiritual meditation yielded significantly better mental health outcomes relative to secular meditation. It is possible that some of the concerns listed above—regarding salience of spiritual content and positive tone—are relevant here: spiritual meditation in this study may not have been sufficiently more spiritual than the regular mindfulness script, and/or some of the findings for mental health in studies by Wachholtz and Pargament (2005 & 2008) may be attributed to the positive tone in the spiritual meditation condition.

Spiritual Health

Mindfulness Meditation vs. Simple Relaxation. All groups experienced a significant pre- to post-test increase in daily spiritual experiences, but no significant between-group differences were found for daily spiritual experiences (measured at pre- and post) or for mystical experiences. These results do not support the hypothesis that mindfulness may lead to better spiritual outcomes relative to relaxation strategies. One explanation for the results of this study is that the mindfulness intervention used here was too abbreviated to replicate findings for MBSR. It is also possible that people tend to experience even secular interventions as spiritual (Wachholtz & Pargament, 2005). Alternatively, as a part of improvement in mental health, people may become naturally become more receptive to positively valenced spiritual experiences (Oman, Shapiro, Thoresen, Flinders, Driskill & Plante, 2007). Just as one would expect improvements in mood when other domains of health improve, spiritual experiences may be an
indicator of spiritual health that likewise improves in tandem with other domains of health. Put another way, it may be that any effective health intervention leads to improvements in spiritual health.

**Spiritual Mindfulness vs. Regular Mindfulness.** Contrary to study hypotheses, this study failed to find significant differences in improvements in spiritual health when comparing regular mindfulness and spiritual mindfulness interventions. This is another finding which calls into question whether the spiritual and regular mindfulness groups differed adequately in their spiritual content.

**Mindful Awareness**

**Mindfulness Meditation vs. Simple Relaxation.** Contrary to study hypotheses, participants in the regular mindfulness group did not report significantly greater state or trait mindfulness relative to the basic relaxation group. Such a finding suggests that a brief, secular mindfulness intervention may be inadequate to convey key aspects of mindfulness. Another possibility is that the measures of mindfulness used in this study have construct validity problems (see Grossman & Van Dam, 2011) or are insufficiently sensitive to detect small, recent changes in mindfulness.

**Spiritual Mindfulness vs. Regular Mindfulness.** Interestingly, state mindfulness was found to be significantly higher in the spiritual mindfulness condition than in the basic relaxation condition and the regular mindfulness condition. This finding is consistent with the hypothesis that spirituality may enhance mindfulness training. Also consistent with this hypothesis are bivariate correlations and moderator analyses conducted as a part of this study. Across conditions, state mindfulness at post-test was found to correlate significantly and positively with self-rated religiousness, daily spiritual experiences at post-test, and connection to the sacred
during practice, while state mindfulness was significantly negatively associated with endorsement of either atheist/agnostic affiliation or no religious affiliation. These findings regarding state mindfulness suggest that, in a more intensive mindfulness intervention or in a study with follow-up assessments, explicit reference to spiritual content may have made a difference in mental health domains. Supporting this possibility are studies showing that changes in state mindfulness scores are significantly positively associated with improvements in physical well-being (Carmody, Reed, Kristeller, & Merriam, 2008) and mental health (Lau, Bishop, Segal, Buis, Anderson, et al., 2006).

Also supporting the potential importance of the sacred in facilitating mindful awareness, moderator analyses yielded a kind of reverse treatment-matching finding for religiousness: participants who rated themselves as less religious to start with derived greater benefit from the spiritual condition relative to other conditions, while this differential treatment effect was mitigated among those who identified as slightly, moderately and very religious. Participants who were more religious to start with may have already been using religion as a resource in managing migraines and other life stressors, while those who were not already religious may have found it helpful to have the relevance of religion and spirituality articulated for them in the mindfulness script. These results contrast with the hypothesis that clients benefit more from interventions that match their own religious commitment (Worthington, 1988). One study testing this hypothesis found that clients’ Christian religious commitment interacted significantly with the use of Christian interventions, such that more religiously committed individuals benefited more from therapy when it included Christian interventions, while less religiously committed individuals did not benefit more from Christian interventions relative to secular interventions (Wade, Worthington, & Vogel, 2007). One might speculate that the contrasting
results found in the present study may be due to important differences between the intentionally flexible, “spiritually-integrated” nature of the spiritual mindfulness script used here and the comparatively more restricted nature of Christian therapy, which presupposes a specifically Christian worldview on the part of the client.

**Implications**

This study provides weak support for the hypothesis that, among people with migraine, very brief mindfulness interventions lead to better outcomes relative to a basic relaxation script. Likewise, this study provides weak support for the hypothesis that adding spiritual content to a mindfulness script enhances benefits of mindfulness training. These results suggest that clinicians with limited time for intervention may find mindfulness scripts (whether spiritual or secular) and basic relaxation scripts roughly equivalently helpful for migraine patients. It is possible that these results generalize to other instances of acute or chronic pain—for instance, patients who are undergoing painful medical treatment, or people struggling with fibromyalgia or low back pain. Mindfulness interventions may be more appropriate when more time is available for training or if stress induced by painful medical procedures is an important target of treatment.

These results provide no support for concerns that spiritual content interferes with mindfulness training. Instead, if anything, spiritual content may be modestly helpful in achieving a state of mindful awareness. Also, presence or absence of religious affiliation was not found to moderate the effect of condition on cold pressor stress or state mindfulness, suggesting that lack of religious affiliation does not hamper a person’s ability to benefit from a spiritual variety of mindfulness relative to secular mindfulness training. These results suggest that mindfulness trainers may find it helpful to draw sensitively on a trainee’s spiritual background when teaching mindfulness meditation.
This study may also allay concerns of religious patients or their religious leaders that a secular meditation strategy may interfere with spiritual well-being, as all groups showed increases in daily spiritual experiences from pre- to post-test. These findings are consistent with other studies of Mindfulness Based Stress Reduction showing that mindfulness training can improve spiritual well-being.

**Limitations and Future Directions**

There are important limitations to this study which affect its generalizability. Most participants were young undergraduates with 2 to 10 headaches per month, and it is unclear that these results would necessarily generalize to a sample of migraine patients in a medical or psychotherapeutic setting. Lack of follow-up is another important limitation. Other studies of meditation have found that some benefits of meditation increase even after the intervention phase of the study is over (Oman, Shapiro, Thoresen, Plante, & Flinders, 2008; Shapiro, Oman, Thoresen, Plant & Flinders, 2008). And, given associations between state mindfulness and improvements in mental health in other studies, it is possible that differences in mental health or physical health benefits may have emerged between conditions as participants repeatedly engaged mindful awareness to cope with stressors or migraines.

Most important for conclusions regarding spiritual integrated treatments, we have reason to be concerned that the spiritual mindfulness script was not sufficiently more spiritual than the standard mindfulness script to effectively test the hypothesis that adding a spiritual component would enhance mindfulness training. It is also unclear that findings for the highly abbreviated mindfulness training used in this study would generalize to more intensive mindfulness training typical of MBSR or other mindfulness interventions. Finally, the appropriateness of spirituality
and mindfulness for pain management may be better tested through mindfulness interventions tailored to the experience of pain, rather than the general scripts used in this study.

A future study could address some of these limitations by repeating the protocol in a patient population, by tailoring interventions to the experience of pain, by providing more intensive or prolonged mindfulness or meditation training, and/or by gathering follow-up data. Regarding the cold pressor portion of the experiment, the methodology could be improved through the use of a more in-depth self-report measure of pain and stress experienced during the task. It would also be useful to measure recovery from pain, for instance, by measuring time until patients report cessation of pain following removal of their hand from the cold water bath (as in Cioffi & Holloway, 1993), or by taking physiological measures that reflect parasympathetic tone, such as heart-rate variability. This would address the possibility that mindful attention can help mitigate the delayed negative effects of life stressors and pain episodes.

Conclusions

This study indicates that, relative to a simple relaxation script, abbreviated mindfulness training provides some benefit regarding pain-related stress among migraineurs, though simple relaxation and brief mindfulness training appear to be roughly equivalent in benefits regarding spiritual health, mental health, and pain tolerance. Results also indicate that adding spiritual content to a mindfulness script provides little additional benefit in improving pain tolerance, mental health, and spiritual outcomes. One important exception is mindful awareness: it appears that spirituality may be an important resource in cultivating a mindful state of awareness. Taken together, results of this study suggest that spiritual concepts may assist individuals in developing mindfulness awareness, rather than hampering their practice.
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### Table 1. Characteristics of completers at pre-test

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<th>Spiritual Mindfulness</th>
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</tr>
<tr>
<td>Other:</td>
<td>2.7%(2)</td>
<td></td>
<td></td>
<td>8.0%(2)</td>
<td></td>
</tr>
<tr>
<td>None/Agn/Atheist</td>
<td>25.7%(19)</td>
<td>27.3%(6)</td>
<td>25.9%(7)</td>
<td>24.0%(6)</td>
<td>0.968</td>
</tr>
<tr>
<td>Agnostic:</td>
<td>6.8%(5)</td>
<td>13.6%(3)</td>
<td>3.7%(1)</td>
<td>4.0%(6)</td>
<td></td>
</tr>
<tr>
<td>None:</td>
<td>17.6%(13)</td>
<td>13.6%(3)</td>
<td>22.2%(6)</td>
<td>16.0%(4)</td>
<td></td>
</tr>
<tr>
<td>Atheist:</td>
<td>1.4%(1)</td>
<td></td>
<td></td>
<td>4.0%(1)</td>
<td></td>
</tr>
<tr>
<td>University Affiliation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>95.6%(70)</td>
<td>90.9%(20)</td>
<td>100%(26)</td>
<td>100.0%(25)</td>
<td>0.295</td>
</tr>
<tr>
<td>Faculty/Empl.</td>
<td>2.7%(2)</td>
<td>9.1%(2)</td>
<td>0%(0)</td>
<td>0%(0)</td>
<td>0.090</td>
</tr>
<tr>
<td>Unaffiliated</td>
<td>0%(0)</td>
<td>0%(0)</td>
<td>0%(0)</td>
<td>0%(0)</td>
<td></td>
</tr>
<tr>
<td>Belief in God:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes:</td>
<td>81.1%(60)</td>
<td>85.7%(18)</td>
<td>74.1%(20)</td>
<td>88.0%(22)</td>
<td>0.449</td>
</tr>
<tr>
<td>No:</td>
<td>5.4%(4)</td>
<td>0%(0)</td>
<td>11.1%(3)</td>
<td>4.0%(1)</td>
<td>0.222</td>
</tr>
<tr>
<td>Not sure:</td>
<td>10.8%(8)</td>
<td>13.6%(3)</td>
<td>11.1%(3)</td>
<td>8.0%(2)</td>
<td>0.829</td>
</tr>
<tr>
<td>Self-rated religiousness:</td>
<td>2.43(0.990)</td>
<td>2.55(1.101)</td>
<td>2.35(1.018)</td>
<td>2.42(0.881)</td>
<td>0.788</td>
</tr>
<tr>
<td>Not all religious:</td>
<td>21.6%(16)</td>
<td>22.7%(5)</td>
<td>25.9%(7)</td>
<td>16.0%(4)</td>
<td>0.687</td>
</tr>
<tr>
<td>Slightly religious:</td>
<td>25.7%(19)</td>
<td>22.7%(5)</td>
<td>22.2%(6)</td>
<td>32.0%(8)</td>
<td>0.682</td>
</tr>
<tr>
<td>Moderately religious:</td>
<td>36.5%(27)</td>
<td>31.8%(7)</td>
<td>37.0%(10)</td>
<td>40.0%(10)</td>
<td>0.848</td>
</tr>
<tr>
<td>Very religious:</td>
<td>13.5%(10)</td>
<td>22.7%(5)</td>
<td>11.1%(3)</td>
<td>8.0%(2)</td>
<td>0.313</td>
</tr>
<tr>
<td>Self-rated spirituality:</td>
<td>2.59(1.025)</td>
<td>2.45(1.011)</td>
<td>2.50(1.068)</td>
<td>2.80(1.000)</td>
<td>0.448</td>
</tr>
<tr>
<td>Not spiritual at all:</td>
<td>18.9%(14)</td>
<td>18.2%(4)</td>
<td>22.2%(6)</td>
<td>16.0%(4)</td>
<td>0.850</td>
</tr>
<tr>
<td>Slightly spiritual:</td>
<td>23.0%(17)</td>
<td>36.4%(8)*</td>
<td>22.2%(6)</td>
<td>12.0%(3)*</td>
<td>0.143</td>
</tr>
</tbody>
</table>
### Mindfulness, Spirituality, and Migraines

#### Frequency of prayer:
- I never pray: 16.2%(12) 18.2%(4) 22.2%(6) 8.0%(2) 0.374
- Formal ceremonies: 9.5%(7) 4.5%(1) 14.8%(4) 24.0%(6) 0.463
  - **In times of stress:** 43.2%(32) 45.5%(10) 25.9%(7)* 60.0%(15)* 0.045
- Regularly: 28.4%(21) 31.8%(7) 29.6%(8) 24.0%(6) 0.831

#### Experience with meditation:
- No previous instr.: 60.8%(45) 72.7%(16) 55.6%(15) 56.0%(14) 0.404
- Rarely practice: 20.3%(15) 22.7%(5) 14.8%(4) 24.0%(6) 0.682
- Sometimes practice: 14.9%(11) 4.5%(1) 18.5%(5) 20.0%(5) 0.273
- Regularly practice: 2.7%(2) 0%(0) 7.4%(2) 0%(0) 0.172

#### Service attend. in the past year:
- 26.81(32.187) 26.36(32.694) 28.92(32.104) 25.00(30.865) 0.909

#### Headaches per month:
- Low (2 to 4): 5.91(3.4) 6.43(3.156) 5.67(3.496) 5.70(3.588) 0.697
- Medium (5 to 10): 45.9%(34) 31.8%(7) 51.9%(14) 52.0%(13) 0.293
- High (11 to 15): 43.2%(32) 59.1%(13) 37.0%(10) 36.0%(9) 0.207

#### HIT-6 score:
- 63.07(4.680) 63.36(4.337) 61.92(5.192) 64.00(4.330) 0.271

#### PHQ9:
- 7.36(4.234) 7.18(3.686) 7.00(5.404) 7.88(3.321) 0.745

#### DSE:
- 51.89(19.56) 49.17(20.61) 54.29(22.43) 51.78(15.45) 0.670

#### HMSE:
- 98.70(19.08) 96.48(20.52) 104.59(17.72) 94.51(18.32) 0.136

#### Total minutes of meditation
- 189.77(51.67) 193.25(64.17) 186.02(44.73) 190.76(48.17) 0.885

* post hoc showed significant difference between bolded groups
Table 2. Correlation matrix relating pre-test religion/spirituality to key outcome variables

<table>
<thead>
<tr>
<th></th>
<th>Cold-pressor-related dependent variables</th>
<th>Mindfulness-related dependent variables</th>
<th>Spirituality-related dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Connect to sacred</td>
<td>Time in water</td>
<td>Pressor Pain</td>
</tr>
<tr>
<td>Female gender</td>
<td>.18</td>
<td>.14</td>
<td>-.02</td>
</tr>
<tr>
<td>White ethnicity</td>
<td>.03</td>
<td>.09</td>
<td>.02</td>
</tr>
<tr>
<td>Self-rated Religious-ness</td>
<td>.46**</td>
<td>.19</td>
<td>-.004</td>
</tr>
<tr>
<td>Self-rated Spirituality</td>
<td>.28*</td>
<td>.11</td>
<td>.08</td>
</tr>
<tr>
<td>Denom: Christian</td>
<td>.318</td>
<td>.08</td>
<td>.08</td>
</tr>
<tr>
<td>Denom: Agn/Ath/None</td>
<td>-.30*</td>
<td>-.06</td>
<td>-.05</td>
</tr>
<tr>
<td>Prior meditation experience: yes</td>
<td>.22</td>
<td>-.08</td>
<td>-.01</td>
</tr>
<tr>
<td>Belief in God: yes</td>
<td>.16</td>
<td>.09</td>
<td>.03</td>
</tr>
<tr>
<td>Belief in God: no</td>
<td>.03</td>
<td>.19</td>
<td>-.14</td>
</tr>
<tr>
<td>Belief in God: unsure</td>
<td>-.17</td>
<td>-.22</td>
<td>.004</td>
</tr>
<tr>
<td>Connect to sacred</td>
<td>---</td>
<td>-.03</td>
<td>.28*</td>
</tr>
<tr>
<td>Time in water</td>
<td>-.03</td>
<td>---</td>
<td>-.10</td>
</tr>
<tr>
<td>Pressor Pain</td>
<td>.28*</td>
<td>-.10</td>
<td>---</td>
</tr>
<tr>
<td>Pressor stress</td>
<td>.13</td>
<td>-.07</td>
<td>.41**</td>
</tr>
<tr>
<td>State anx.</td>
<td>-.05</td>
<td>-.18</td>
<td>.27*</td>
</tr>
<tr>
<td>TMS</td>
<td>.41**</td>
<td>.24*</td>
<td>.20</td>
</tr>
<tr>
<td>MAAS</td>
<td>.17</td>
<td>.02</td>
<td>-.16</td>
</tr>
<tr>
<td>DSES2</td>
<td>.56*</td>
<td>-.09</td>
<td>.10</td>
</tr>
<tr>
<td>EBS</td>
<td>.37*</td>
<td>-.15</td>
<td>.15</td>
</tr>
<tr>
<td>Myst</td>
<td>.45*</td>
<td>-.14</td>
<td>-.01</td>
</tr>
</tbody>
</table>

TMS = Toronto mindfulness scale—state mindfulness reported during cold pressor task
MAAS = Mindful Awareness and Attention Scale—trait mindfulness
DSES2 = Daily Spiritual Experience Scale at post-test
EBS = Engagement with Beauty Scale, nature subscale—awe of nature
Myst = Mystical Experiences Scale
* p < 0.05
**p<0.01
Table 3. Post-only variables: Estimated marginal means and their respective standard errors, controlling for white ethnicity

<table>
<thead>
<tr>
<th></th>
<th>Regular Mindfulness</th>
<th>Spiritual Mindfulness</th>
<th>Simple Relaxation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in water (min)</td>
<td>80.84(22.25)</td>
<td>100.29(19.55)</td>
<td>83.26(19.76)</td>
</tr>
<tr>
<td>Pressor pain</td>
<td>5.62(0.49)</td>
<td>6.14(0.43)</td>
<td>6.07(0.44)</td>
</tr>
<tr>
<td>Pressor stress</td>
<td>1.16(0.23)</td>
<td>1.22(0.20)</td>
<td>1.84^a,b(0.20)</td>
</tr>
<tr>
<td>State anxiety</td>
<td>31.03(2.46)</td>
<td>36.28(2.26)</td>
<td>35.56(2.28)</td>
</tr>
<tr>
<td>Anxiety Disorder</td>
<td>4.90(0.91)</td>
<td>5.30(0.84)</td>
<td>5.57(0.84)</td>
</tr>
<tr>
<td>Anxiety-related Impairment</td>
<td>1.65(0.12)</td>
<td>1.50(0.13)</td>
<td>1.78(0.12)</td>
</tr>
<tr>
<td>Trait Mindfulness</td>
<td>62.40(2.91)</td>
<td>65.81(2.68)</td>
<td>65.42(2.70)</td>
</tr>
<tr>
<td>State mindfulness</td>
<td>23.77(1.84)</td>
<td>31.33^a,c(1.70)</td>
<td>25.90(1.71)</td>
</tr>
<tr>
<td>Curiosity scale</td>
<td>11.05(1.13)</td>
<td>15.56^a,c(1.04)</td>
<td>12.57(1.04)</td>
</tr>
<tr>
<td>Decentering scale</td>
<td>12.73(0.96)</td>
<td>15.77^a,d(0.88)</td>
<td>13.33(0.88)</td>
</tr>
<tr>
<td>Awe of nature</td>
<td>11.76(0.94)</td>
<td>12.19(0.86)</td>
<td>11.90(0.87)</td>
</tr>
<tr>
<td>Mysticism scale</td>
<td>113.80(5.17)</td>
<td>117.03(4.76)</td>
<td>112.74(4.79)</td>
</tr>
<tr>
<td>Subjective relaxation</td>
<td>3.07(0.18)</td>
<td>3.09(0.18)</td>
<td>3.05(0.17)</td>
</tr>
<tr>
<td>Subjective helpfulness</td>
<td>2.61(0.21)</td>
<td>2.82(0.20)</td>
<td>2.36(0.19)</td>
</tr>
<tr>
<td>Fit with spirituality</td>
<td>2.06(0.30)</td>
<td>2.46(0.30)</td>
<td>2.03(0.29)</td>
</tr>
<tr>
<td>Connected with sacred</td>
<td>1.11(0.26)</td>
<td>1.83^c,d(0.25)</td>
<td>1.06(0.24)</td>
</tr>
</tbody>
</table>

Post-hoc information:
a Significantly greater than RegMind at 0.05 level
b Significantly greater than SpirMind at 0.05 level
c Signif greater than Simple Relaxation at 0.05 level
d Greater than RegMind at 0.10 level
*at 0.01 level
Bolded = found significance for this statistic relative to other groups
Or if row label is bolded, significant overall F for effect of condition
Table 4. Post-only variables: F-statistics and degrees of freedom for overall and post-hoc comparisons for effect of condition on dependent variable, with white ethnicity as a covariate.

<table>
<thead>
<tr>
<th>Variable</th>
<th>F-stat(DF1, DF2)</th>
<th>p-value</th>
<th>Mean diff (i-j) (std. error)</th>
<th>p-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in water (min)</td>
<td>1.533 (2, 66)</td>
<td>0.223</td>
<td>-0.67(0.30)</td>
<td>0.026</td>
<td>0.257</td>
</tr>
<tr>
<td>Cold pressor pain</td>
<td>0.346 (2, 68)</td>
<td>0.709</td>
<td>-0.63(0.29)</td>
<td>0.034</td>
<td>0.146</td>
</tr>
<tr>
<td>Cold pressor stress</td>
<td>3.42 (2, 68)</td>
<td>0.038</td>
<td>0.061(0.31)</td>
<td>0.845</td>
<td>0.146</td>
</tr>
<tr>
<td>State anxiety</td>
<td>1.387 (2, 70)</td>
<td>0.257</td>
<td>-2.13(2.49)</td>
<td>0.396</td>
<td>0.321</td>
</tr>
<tr>
<td>Anx. Disorder Symptoms</td>
<td>0.146 (2, 70)</td>
<td>0.865</td>
<td>5.43(2.50)</td>
<td>0.03</td>
<td>0.049</td>
</tr>
<tr>
<td>Anx.-related Impair.</td>
<td>1.43 (2, 67)</td>
<td>0.247</td>
<td>7.56(2.57)</td>
<td>0.004</td>
<td>0.005</td>
</tr>
<tr>
<td>Trait Mindfulness</td>
<td>0.425 (2,70)</td>
<td>0.656</td>
<td>-1.52(1.52)</td>
<td>0.321</td>
<td>0.639</td>
</tr>
<tr>
<td>State mindfulness</td>
<td>4.67 (2, 70)</td>
<td>0.012</td>
<td>3.00(1.50)</td>
<td>0.049</td>
<td>0.059</td>
</tr>
<tr>
<td>Curiosity</td>
<td>4.344 (2, 70)</td>
<td>0.017</td>
<td>4.52(1.57)</td>
<td>0.004</td>
<td>0.026</td>
</tr>
<tr>
<td>Decentering</td>
<td>2.99 (2, 70)</td>
<td>0.057</td>
<td>-0.608(1.3)</td>
<td>0.639</td>
<td>0.77(0.35)</td>
</tr>
<tr>
<td>Awe of nature</td>
<td>0.057 (2, 70)</td>
<td>0.945</td>
<td>7.22(0.37)</td>
<td>0.898</td>
<td>0.033</td>
</tr>
<tr>
<td>Mysticism scale</td>
<td>0.207 (2, 70)</td>
<td>0.813</td>
<td>0.77(0.35)</td>
<td>0.033</td>
<td>0.055</td>
</tr>
<tr>
<td>Subjective relax.</td>
<td>0.009 (2, 67)</td>
<td>0.991</td>
<td>0.722(0.37)</td>
<td>0.898</td>
<td>0.033</td>
</tr>
<tr>
<td>Subjective helpful.</td>
<td>1.349 (2, 67)</td>
<td>0.266</td>
<td>0.77(0.35)</td>
<td>0.033</td>
<td>0.055</td>
</tr>
<tr>
<td>Fit with spirituality</td>
<td>0.63 (2, 66)</td>
<td>0.538</td>
<td>0.722(0.37)</td>
<td>0.898</td>
<td>0.033</td>
</tr>
<tr>
<td>Connect with sacred</td>
<td>2.786 (2, 67)</td>
<td>0.069</td>
<td>0.77(0.35)</td>
<td>0.033</td>
<td>0.055</td>
</tr>
</tbody>
</table>

Note: Levene’s test was significant for State mindfulness, Curiosity, and Decentering.
Table 5. Effect of time on pre-post variables: estimated marginal means and their respective standard errors, with white ethnicity as covariate

<table>
<thead>
<tr>
<th></th>
<th>Regular Mindfulness M(SE)</th>
<th>Spiritual Mindfulness M(SE)</th>
<th>Simple Relaxation M(SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HMSE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>96.29(4.10)</td>
<td>104.85(3.84)</td>
<td>94.41(3.81)</td>
</tr>
<tr>
<td>Post</td>
<td>125.45(4.78)</td>
<td>125.12(4.48)</td>
<td>123.34(4.44)</td>
</tr>
<tr>
<td><strong>Pre-post effect size across groups (significance)</strong> = 0.377 (p &lt;&lt;0.0001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Depression</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistic:</td>
<td>41.74</td>
<td>8.69</td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>7.35(0.93)</td>
<td>6.77(0.87)</td>
<td>7.97(0.86)</td>
</tr>
<tr>
<td>Post</td>
<td>4.88(0.91)</td>
<td>5.23(0.86)</td>
<td>5.54(0.85)</td>
</tr>
<tr>
<td><strong>Pre-post overall effect size across groups (significance) = 0.113 (p=0.004)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Depression-related impairment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>1.79(0.11)</td>
<td>1.67(0.10)</td>
<td>1.92(0.11)</td>
</tr>
<tr>
<td>Post</td>
<td>1.64(0.12)</td>
<td>1.50(0.11)</td>
<td>1.72(0.12)</td>
</tr>
<tr>
<td><strong>Pre-post effect size across groups (significance) = 0.044(p = 0.088)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Daily Spiritual Experiences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>50.52(4.16)</td>
<td>54.44(4.08)</td>
<td>52.54(3.86)</td>
</tr>
<tr>
<td>Post</td>
<td>57.62(4.61)</td>
<td>58.92(4.52)</td>
<td>57.31(4.27)</td>
</tr>
<tr>
<td><strong>Pre-post effect size across groups (significance) = 0.077 (p &lt;0.0218)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F-statistic:</strong></td>
<td>5.622</td>
<td>3.005</td>
<td></td>
</tr>
<tr>
<td>Degrees of Freedom:</td>
<td>1, 69</td>
<td>1, 69</td>
<td></td>
</tr>
</tbody>
</table>
Table 6. Effect of condition on pre-post variables: F-statistics and degrees of freedom for effect of condition on difference scores pre to post for each dependent variable, with white ethnicity as a covariate.

<table>
<thead>
<tr>
<th>Variable</th>
<th>F-stat(DF1, DF2)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMSE</td>
<td>1.34 (2,69)</td>
<td>0.27</td>
</tr>
<tr>
<td>Depression</td>
<td>0.255 (2, 69)</td>
<td>0.776</td>
</tr>
<tr>
<td>Dep.-related impair.</td>
<td>1.64 (2, 65)</td>
<td>0.202</td>
</tr>
<tr>
<td>Daily Spirit. Experiences</td>
<td>0.442 (2, 67)</td>
<td>0.644</td>
</tr>
</tbody>
</table>
Table 7. Moderators for effect of condition on state mindfulness (TMS)

Self-rated religiousness

<table>
<thead>
<tr>
<th>Condition</th>
<th>Overall</th>
<th>Regular Mindful.(i) vs. Simple Relax.(j)</th>
<th>Spiritual Mindful.(i) vs. Simple Relax.(j)</th>
<th>Spiritual Mindful.(i) vs. Regular Mindful.(j)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-stat(DF1, DF2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total sample (3x4 ANOVA)</td>
<td>2.762 (6, 59)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$p = 0.020$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not religious at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.185 (2, 12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$p = 0.024$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean difference (i-j)</td>
<td>-5.42(4.74)</td>
<td>11.17(5.40)</td>
<td>16.59(5.16)</td>
<td></td>
</tr>
<tr>
<td>Significance ($p$)</td>
<td>0.275</td>
<td><strong>0.061</strong></td>
<td><strong>0.007</strong></td>
<td></td>
</tr>
<tr>
<td>Slightly religious</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.762(2, 15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$p = 0.205$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean difference (i-j)</td>
<td>-6.98(4.61)</td>
<td>1.80(4.38)</td>
<td>8.78(4.93)</td>
<td></td>
</tr>
<tr>
<td>Significance ($p$)</td>
<td>0.151</td>
<td>0.686</td>
<td><strong>0.095</strong></td>
<td></td>
</tr>
<tr>
<td>Moderately religious</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.975 (2, 23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$p = 0.033$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean difference (i-j)</td>
<td>8.07(3.82)</td>
<td>9.55(3.73)</td>
<td>1.48(4.14)</td>
<td></td>
</tr>
<tr>
<td>Significance ($p$)</td>
<td><strong>0.046</strong></td>
<td><strong>0.018</strong></td>
<td>0.723</td>
<td></td>
</tr>
<tr>
<td>Slightly religious</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.248(2, 6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$p = 0.111$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean difference (i-j)</td>
<td>-13.54(5.68)</td>
<td>-6.56(6.56)</td>
<td>6.97(4.86)</td>
<td></td>
</tr>
<tr>
<td>Significance ($p$)</td>
<td><strong>0.054</strong></td>
<td>0.355</td>
<td>0.202</td>
<td></td>
</tr>
</tbody>
</table>

Headache Management Self-Efficacy at pre-test (HMSE)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Overall</th>
<th>Regular Mindful.(i) vs. Simple Relax.(j)</th>
<th>Spiritual Mindful.(i) vs. Simple Relax.(j)</th>
<th>Spiritual Mindful.(i) vs. Regular Mindful.(j)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-stat(DF1, DF2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total sample (3x3 ANOVA)</td>
<td>3.060 (4, 63)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$p = 0.023$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low HMSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.872 (2, 19)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$p = 0.020$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean difference (i-j)</td>
<td>0.00(4.51)</td>
<td>15.17(5.09)</td>
<td>15.17(5.36)</td>
<td></td>
</tr>
<tr>
<td>Significance ($p$)</td>
<td>1.000</td>
<td><strong>0.011</strong></td>
<td><strong>0.011</strong></td>
<td></td>
</tr>
<tr>
<td>Medium HMSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.404 (2, 22)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$p = 0.672$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean difference (i-j)</td>
<td>3.38(3.97)</td>
<td>0.097(3.68)</td>
<td>-3.29(4.38)</td>
<td></td>
</tr>
<tr>
<td>Significance ($p$)</td>
<td>0.403</td>
<td>0.979</td>
<td>0.461</td>
<td></td>
</tr>
<tr>
<td>High HMSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.118 (2, 20)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
\[ p = 0.032 \]

<table>
<thead>
<tr>
<th>Mean difference (i-j)</th>
<th>Significance (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5.02(4.26)</td>
<td>0.252</td>
</tr>
<tr>
<td>4.93(3.93)</td>
<td>0.225</td>
</tr>
<tr>
<td>9.94(3.48)</td>
<td><strong>0.010</strong></td>
</tr>
</tbody>
</table>
Figure 1. Interaction between condition and self-rated religiousness for state mindfulness (TMS)

Estimated Marginal Means of POST_TMS_TOTAL

Covariates appearing in the model are evaluated at the following values: White_ethnicity = .7222

Not at all religious = 16
Slightly religious = 19
Moderately religious = 27
Very religious = 10
Figure 2. Interaction between condition and headache management self-efficacy (HMSE) for state mindfulness (TMS)

Covariates appearing in the model are evaluated at the following values: White_ethnicity = .7260

N for low HMSE (1) = 23
N for med HMSE (2) = 26
N for high HMSE (3) = 2
APPENDICES

APPENDIX A. ID-MIGRAINE SCREENER

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do your headaches make you feel nauseated or sick to your stomach?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did your headaches limit you from working, studying, or doing what you</td>
<td></td>
<td></td>
</tr>
<tr>
<td>needed to do for any day in the previous 3 months?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does light bother you a lot more than when you don’t have headaches?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How many headaches like these did you have in the last month?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Circle One:
APPENDIX B. DAILY ADHERENCE DIARY

Daily Adherence Diary – Day # ______

Date _________         ID# ______

Did you perform the meditation for 20 minutes today?    ______ Yes      ______ No (check one)

Did you have a headache today?   ______ Yes      ______ No (check one)

If yes, how painful was it at its worst?
Rate between 1 (no pain) to 10 (unbearable pain) ______

Did you take medicine for this headache? ______ Yes      ______ No (check one)
If yes, what type and how much?
_________________________________________________________________

Because of your headache, how limited were you in your ability to do usual activities including household work, work, school, or social activities?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
</table>

How fed up or frustrated did you feel today because of your headache(s)?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
</table>

General Mood: Please circle the number describing how you felt today in general.

<table>
<thead>
<tr>
<th>Negative</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  2  3  4  5  6  7</td>
<td></td>
</tr>
</tbody>
</table>

Additional comments, including unusual/notable experiences during headache or meditation:
CORRECTIVE QUESTIONS APPENDED TO DAIRY 1 FOR MINDFULNESS GROUPS

For Regular Mindfulness Group (A)

Here are few statements about how to practice the assigned technique. Which of these statements sounds INCONSISTENT (doesn’t fit) with the technique you’ve been taught? (Choose one.)
A. Focusing on the breath helps you escape your present experience.
B. An important part of this technique is to focus on the physical sensations of breathing.
C. It can be calming to focus on the breath because of its gentle rhythm and life-sustaining function.
Answer: A

Here are few statements about how to practice the assigned technique. Which of these statements sounds INCONSISTENT (doesn’t fit) with the technique you’ve been taught? (Choose one.)
A. This technique is meant to help people think about the future instead of the past.
B. Paying attention to the present may help you deal with stressful experiences more effectively.
C. Paying attention to the present may help you see what is going on around you more clearly.
Answer: A.

For Spiritual Mindfulness Group (B)

Here are few statements about how to practice the assigned technique. Which of these statements sounds INCONSISTENT (doesn’t fit) with the technique you’ve been taught? (Choose one.)
A. Some Christians refer to this and similar practices as “practicing the presence of God.”
B. You must have specific spiritual beliefs to practice this technique.
C. A Buddhist may use this practice to get in touch with the Buddha nature, or the spiritual core Buddhists believe is at the center of our being.
Answer: B

Here are few statements about how to practice the assigned technique. Which of these statements sounds INCONSISTENT (doesn’t fit) with the technique you’ve been taught? (Choose one.)
A. Before tuning into the breath, you could say a prayer asking for assistance, if that fits with your spiritual background.
B. You must believe in a higher power to practice this technique.
C. The Holy Spirit is sometimes referred to as the “Breath of God.”
Answer: B.
CORRECTIVE QUESTIONS APPENDED TO DIARY 2 FOR MINDFULNESS GROUPS

Please answer these questions.
When something distracts you from your breathing during meditation, how can you manage it in a manner consistent with the technique?

A) Do your best to ignore distractions and concentrate harder on the breath.
B) Acknowledge the unpleasant feeling or thought and then gently bring your attention back to the breath.
C) Let your mind wander undirected and focus on whatever pulls for your attention.
Correct answer: B

If your mind wanders over and over, or if an unpleasant feeling persists during meditation, what does this indicate about how well you are meditating?
A) This indicates you are meditating well. The idea is to just keep following your thoughts and feelings wherever they lead you.
B) This means you are having trouble with the technique. But don’t be hard on yourself, you will get better with practice.
C) This has little bearing on how well you are meditating. The idea is to present with what is going on right now, using the breath as your anchor.
Correct answer: C
APPENDIX C. MANIPULATION CHECK & SUBJECTIVE ONE-ITEM QUESTIONS

(administer after depression measure in post-test assessment)
Please answer the following questions with respect to the technique you were taught to practice as a part of this study.

How relaxing did you find your assigned meditation technique to be?
How helpful did you find your assigned technique to be?
How well did your assigned technique fit with your spiritual background?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>A little</td>
<td>Moderately</td>
<td>Quite a bit</td>
<td>Very Much</td>
</tr>
</tbody>
</table>

Thinking about your experience during your daily practice, how often did you feel connected to something transcendent, ultimate, or sacred?

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rarely or never</td>
<td>Sometimes</td>
<td>About half the time</td>
<td>Most of the time</td>
<td>All or nearly all of the time</td>
</tr>
</tbody>
</table>

(administer after cold-pressor task)

Please indicate how painful this task was on a scale of 1 (no pain) to 10 (pain as bad as it could be). ______________

How stressful was this task for you? Circle a number.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>A little</td>
<td>Moderately</td>
<td>Quite a bit</td>
<td>Very Much</td>
</tr>
</tbody>
</table>
APPENDIX D: POST-TEST SESSION SCRIPT

Hi, thanks for coming in. Today I’m going to ask you to practice your assigned technique for 15 minutes, then do something called the cold pressor task, where you will be asked to hold your non-dominant hand in cold water for a period of time. Are you right handed or left handed? [you already have this info, but it would be good to double check.] After the task is over I’ll ask you to fill out a series of questionnaires. The whole process should take about 45 minutes. Does that sound okay?

Alright, let me explain in more detail what you are going to do. In a few minutes I will ask you to start practicing your technique and then I will leave the room. After 15 minutes I will return and signal you to place your hand in the water up to your wrist, while continuing to practice your technique. When it becomes too uncomfortable, you may remove your hand. If you have not removed your hand after 5 minutes, I will signal you to do so. Do you have any questions?

Let me just check the temperature quickly. [check that temp is still between 32 and 34 degrees Fahrenheit —record on laptop or cold pressor note sheet] If need to change position of chair, do it at this time as well.

Okay now I’m going to leave the room to let you practice your technique. After 15 minutes I’ll return to remind you of the instructions for the next part. Please begin practicing your technique at this time.

[Leave room bringing key with you, and close the door behind you, start timer for 15 minutes.]  
[When 15 minutes are up, return to room]

Okay now we will start the cold pressor task. Remember I will stop you after 5 minutes, but feel free to take your hand out of the water before that if it becomes too uncomfortable. Please continue to practice your technique while your hand is in the water. Go ahead and place your hand in the water now. [Begin timing.]

When participant removes hand,

- Stop timer: record time on laptop or on cold pressor note sheet.
- Provide towel to participant
- Check temperature: record on laptop or on cold pressor note sheet.

(Afterwards, have participant complete post-test survey packet.)

(Debrief participant and provide headache referrals if requested)
APPENDIX E. STATE-TRAIT ANXIETY INVENTORY, STATE SCALE
A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Somewhat</th>
<th>Moderately</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel calm.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. I feel secure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I am tense.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. I feel strained.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. I feel at ease</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. I feel upset.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I am presently worrying over possible misfortunes.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. I feel satisfied.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. I feel frightened.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. I feel comfortable.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. I feel self-confident.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. I feel nervous.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. I am jittery.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. I feel indecisive.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. I am relaxed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. I feel content.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. I am worried.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18. I feel confused.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>19. I feel steady.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20. I feel pleasant.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
APPENDIX F. GENERALIZED ANXIETY DISORDER SCALE (GAD-7)

Please circle the appropriate number of your answer for each of the questions below:

Over the last 2 weeks, how often have you been bothered by the following problems?

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Feeling nervous, anxious or on edge</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Not being able to stop or control worrying</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Worrying too much about different things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Trouble relaxing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Being so restless that it is hard to sit still</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Becoming easily annoyed or irritable</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Feeling afraid as if something awful might happen</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

□ Not difficult at all □ Somewhat difficult □ Very difficult □ Extremely difficult
APPENDIX G. PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

Please circle the appropriate number of your answer for each of the questions below:

Over the last 2 weeks, how often have you been bothered by any of the following problems?

<table>
<thead>
<tr>
<th>Question</th>
<th>Not at all</th>
<th>Several Days</th>
<th>More than half the days</th>
<th>Nearly everyday</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Little interest or pleasure in doing things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Feeling down, depressed or hopeless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Trouble falling or staying asleep, or sleeping too much</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Feeling tired or having little energy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Poor appetite or overeating</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Trouble concentrating on things, such as reading the newspaper or watching television</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Thoughts that you would be better off dead or hurting yourself in some way</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

□ Not difficult at all          □ Somewhat difficult          □ Very difficult          □ Extremely difficult
APPENDIX H. HEADACHE MANAGEMENT SELF-EFFICACY SCALE

Instructions: You will find below a number of statements related to headaches. Please read each statement carefully and indicate how much you agree or disagree with the statement by circling a number next to it. Use the following scale as a guide:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Moderately Disagree</th>
<th>Slightly Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Slightly Agree</th>
<th>Moderately Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
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<td>3</td>
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<td>6</td>
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<tr>
<td>7</td>
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</tr>
</tbody>
</table>

1. I can keep even a bad headache from disrupting my day by changing the way I respond to pain.  
2. When I’m in some situations, nothing I do will prevent headaches.  
3. I can reduce the intensity of a headache by relaxing.  
4. There are things I can do to reduce headache pain.  
5. I can prevent headaches by recognizing headache triggers.  
6. Once I have a headache there is nothing I can do to control it.  
7. When I’m tense, I can prevent headaches by controlling the tension.  
8. Nothing I do reduces the pain of a headache.  
9. If I do certain things every day, I can reduce the number of headaches I will have.  
10. If I can catch a headache before it begins, I often can stop it.  
11. Nothing I do will keep a mild headache from turning into a bad headache.  
12. I can prevent headache by changing how I respond to stress.  
13. I can do things to control how much my headaches interfere with my life.  
14. I cannot control the tension that causes my headaches.  
15. I can do things that will control how long a headache lasts.  
16. Nothing I do will keep a bad headache from disrupting my day.  
17. When I’m not under a lot of stress, I can prevent many headaches.  
18. When I sense a headache is coming, there is nothing I can do to stop it.  
19. I can keep a mild headache from disrupting my day by changing the way I respond to pain.  
20. If I’m under a lot of stress, there is nothing I can do to prevent headaches.  
21. I can do things that make a headache not so bad.  
22. There are things I can do to prevent headaches.  
23. If I’m upset, there is nothing I can do to prevent headaches.  
24. I can control the intensity of headache pain.  
25. I can do things to cope with my headaches.
APPENDIX I. HEADACHE IMPACT TEST – 6-ITEM VERSION

This questionnaire was designed to help you describe and communicate the way you feel and what you cannot do because of headaches. **Please circle one answer for each question.**

1) When you have headaches, how often is the pain severe?

- Never
- Rarely
- Sometimes
- Very Often
- Always

2) How often do headaches limit your ability to do usual daily activities including household work, work, school, or social activities?

- Never
- Rarely
- Sometimes
- Very Often
- Always

3) When you have a headache, how often do you wish you could lie down?

- Never
- Rarely
- Sometimes
- Very Often
- Always

4) In the past 4 weeks, how often have you felt too tired to do work or daily activities because of your headaches?

- Never
- Rarely
- Sometimes
- Very Often
- Always

5) In the past 4 weeks, how often have you felt fed up or irritated because of your headaches?

- Never
- Rarely
- Sometimes
- Very Often
- Always

6) In the past 4 weeks, how often did headaches limit your ability to concentrate on work or daily activities?

- Never
- Rarely
- Sometimes
- Very Often
- Always
APPENDIX J. DEMOGRAPHICS QUESTIONS

1. Which of the following best describes your experience with meditation and relaxation strategies?
   A. I have never received instruction in meditation or relaxation.
   B. I have received instruction, but I rarely practice relaxation or meditation.
   C. I have received instruction, and I sometimes practice relaxation or meditation.
   D. I have received instruction, and I regularly practice relaxation or meditation.

2. What denomination/religion you were raised in? (please check whichever you think most accurately reflects the religious affiliation that you were raised in, regardless of whether you are still affiliated with this religion/denomination):
   A. Christian—non-Catholic
   B. Roman Catholic
   C. Muslim
   D. Jewish
   E. Agnostic
   F. Other
      If other: please specify: ___________________________________________
   G. None

3. Denomination/religion you are currently affiliated with (please check whichever you think most accurately reflects your current religious affiliation—or lack thereof):
   A. Christian—non-Catholic
   B. Roman Catholic
   C. Muslim
   D. Jewish
   E. Agnostic
   F. Other
      If other: please specify: ___________________________________________
   G. None

4. Which of the following best describes your practice of prayer? (circle a letter)
   A. Prayer is a regular part of my daily life.
B. I usually pray in times of stress or need but rarely at any other time.
C. I pray only for formal ceremonies.
D. I never pray.

5. To what extent do you consider yourself a religious person? (circle a letter)
   A. Very religious
   B. Moderately religious
   C. Slightly religious
   D. Not religious at all

6. To what extent do you consider yourself a spiritual person? (circle a letter)
   A. Very spiritual
   B. Moderately spiritual
   C. Slightly spiritual
   D. Not spiritual at all

7. How many times have you attended religious services during the past year? (give your best estimate):
   _______ times.

8. What best describes your affiliation with the university? (circle letter corresponding to your answer)
   A. Undergraduate student
   B. Graduate student
   C. Faculty or Employee
   D. Not affiliated

9. Your age in years ________

10. Gender (check one): Male ______ Female_____

11. Race (check whichever you think most accurately reflects your race):
    A. Caucasian
    B. African American
    C. Hispanic/Latino-a
    D. Other
If other, please specify: ________________________________________________
APPENDIX K: DAILY SPIRITUAL EXPERIENCES SCALE

The list that follows includes items that you may or may not experience. Referring to the past few weeks, please consider if and how often you have these experiences, and try to disregard whether or not you feel you should or should not have them. A number of items use the word “God.” If this word is not a comfortable one, please substitute another idea that calls to mind the divine or holy for you.

<table>
<thead>
<tr>
<th>Put a check mark the appropriate box. Please refer to your experience over the past few weeks.</th>
<th>Never or almost never</th>
<th>Once in a while</th>
<th>Some days</th>
<th>Most days</th>
<th>Every day</th>
<th>Many times a day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel God’s presence.</td>
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<td>2. I experience a connection to all of life.</td>
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<td>3. During worship, or at other times when connecting with God, I feel joy which lifts me out of daily concerns.</td>
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<td>4. I find strength in my religion or spirituality.</td>
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<td>5. I find comfort in my religion or spirituality.</td>
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<td>6. I feel deep inner peace or harmony.</td>
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<td>7. I ask for God’s help in the midst of daily activities.</td>
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<tr>
<td>8. I feel guided by God in the midst of daily activities.</td>
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<tr>
<td>9. I feel God’s love for me directly.</td>
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<tr>
<td>10. I feel God’s love for me through others.</td>
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<td>11. I am spiritually touched by the beauty of creation.</td>
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<td>12. I feel thankful for my blessings.</td>
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<tr>
<td>13. I feel a selfless caring for others.</td>
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<tr>
<td>14. I accept others even when they do things I think are wrong.</td>
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<tr>
<td>15. I desire to be closer to God or in union with the divine.</td>
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<tr>
<td>16. During the past few weeks, how close have you felt to God? (circle one)</td>
<td>Not close</td>
<td>Somewhat close</td>
<td>Very close</td>
<td>As close as possible</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPENDIX L: MYSTICISM SCALE

Instructions: Below are brief descriptions of a number of experiences. Some descriptions refer to phenomena that you may not have experienced. In each case note the description carefully and circle the mark (+2, -1, ?, -1, -2) according to how much the description applies to your own experience.

-2: This description is definitely not true of my own experience or experiences.
-1: This description is probably not true of my own experience or experiences.
?: I cannot decide if this description is true or not true of my own experiences.
+1: This description is probably true of my own experience or experiences.
+2: This description is definitely true of my own experience or experiences.

Please mark each item trying to avoid if at all possible marking any item with a ?. In responding to each item, please understand that the items may be considered as applying to one experience or as applying to several different experiences. After completing this questionnaire, please be sure that all items have been marked—leave no items unanswered.

<table>
<thead>
<tr>
<th></th>
<th>Definitely not true</th>
<th>Probably true</th>
<th>Cannot decide</th>
<th>Probably true</th>
<th>Definitely true</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I have had an experience which was both timeless and spaceless.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>2. I have never had an experience which was incapable of being expressed in words.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>3. I have had an experience in which something greater than myself seemed to absorb me.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>4. I have had an experience in which everything seemed to disappear from my mind until I was conscious of only a void.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>5. I have experienced profound joy.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>6. I have never had an experience in which I felt myself to be absorbed as one with all things.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>7. I have never experienced a perfectly peaceful state.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>8. I have never had an experience in which I felt as if all things were alive.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>9. I have never had an experience which seemed holy to me.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>10. I have never had an experience in which all things seemed to be aware.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>11. I have had an experience in which I had no sense of time or space.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
<tr>
<td>12. I have had an experience in which I realized the oneness of myself with all things.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
<td>+2</td>
</tr>
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</tr>
<tr>
<td>13.</td>
<td>I have had an experience in which a new view of reality was revealed to me.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>14.</td>
<td>I have <strong>never</strong> experienced anything to be divine.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>15.</td>
<td>I have <strong>never</strong> had an experience in which time and space were nonexistent.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>16.</td>
<td>I have <strong>never</strong> experienced anything that I could call ultimate reality.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>17.</td>
<td>I have had an experience in which ultimate reality was revealed to me.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>18.</td>
<td>I have had an experience in which I felt that all was perfection at that time.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>19.</td>
<td>I have had an experience in which I felt everything in the world to be part of the same whole.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>20.</td>
<td>I have had an experience which I knew to be sacred.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>21.</td>
<td>I have <strong>never</strong> had an experience which I was unable to express adequately through language.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>22.</td>
<td>I have had an experience which left me with a feeling of awe.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>23.</td>
<td>I have had an experience that is impossible to communicate.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>24.</td>
<td>I have <strong>never</strong> had an experience in which my own self seemed to merge into something greater.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>25.</td>
<td>I have <strong>never</strong> had an experience which left me with a feeling of wonder.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>26.</td>
<td>I have <strong>never</strong> had an experience in which deeper aspects of reality were revealed to me.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>27.</td>
<td>I have <strong>never</strong> had an experience in which time, place, and distance were meaningless.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>28.</td>
<td>I have <strong>never</strong> had an experience in which I became aware of the unity of all things.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>29.</td>
<td>I have had an experience in which all things seemed to be conscious.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>30.</td>
<td>I have <strong>never</strong> had an experience in which all things seemed to be unified into a single whole.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>31.</td>
<td>I have had an experience in which I felt nothing is ever really dead.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
<tr>
<td>32.</td>
<td>I have had an experience that cannot be expressed in words.</td>
<td>-2</td>
<td>-1</td>
<td>?</td>
<td>+1</td>
</tr>
</tbody>
</table>
APPENDIX M: ENGAGEMENT WITH BEAUTY SCALE

In regard to all the responses below: Keep in mind that we are only asking about your *experience with perceiving and feeling something as beautiful*. We are *not* asking if you like something; we are *not* asking if you think something is important; we only ask if you *feel it as beautiful*.

Put a *check mark* in the appropriate box to indicate how frequently you have been having each of these experiences over *the past few weeks*.

<table>
<thead>
<tr>
<th>Statements 1-4 refer to experiences with nature and the physical world, including mountains, rocks, rivers, lakes, oceans, deserts, plants, flowers, trees, animals, etc. (but NOT the human body). Remember to refer to your experience over <em>the past few weeks</em>.</th>
<th>Never or almost never</th>
<th>Once in a while</th>
<th>Some days</th>
<th>Most Days</th>
<th>Every Day</th>
<th>Many times a day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I notice beauty in one more aspects of nature.</td>
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<tr>
<td>2. I experience beauty in nature so intensely that I feel changes in my body, such as a lump in my throat, an expansion in my chest, faster heart beat, or other bodily responses.</td>
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<tr>
<td>3. I experience beauty in nature so intensely emotional, it “moves me,” such as a feeling of awe or wonder or excitement or admiration or upliftment.</td>
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<tr>
<td>4. I experience beauty in nature so intensely that I feel something like a spiritual experience, perhaps a sense of oneness, or being united with the universe, or a love of the entire world.</td>
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</table>
APPENDIX N. MINDFUL ATTENTION AND AWARENESS SCALE:

Below is a collection of statements about your everyday experience. Using the grid below, please indicated how frequently or infrequently you currently have each experience, referring to the past few weeks. Please answer according to what really reflects your experience rather than what you think your experience should be.

Check the box corresponding to your answer for a particular item. Possible answer choices range from Almost never furthest to the left, to Almost always furthest to the right. Remember, refer to your experiences over the past few weeks.

<table>
<thead>
<tr>
<th></th>
<th>Almost never</th>
<th>Very infrequently</th>
<th>Somewhat infrequently</th>
<th>Somewhat frequently</th>
<th>Very frequently</th>
<th>Almost always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I could be experiencing some emotion and not be conscious of it until some time later.</td>
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<tr>
<td>2. I break or spill things because of carelessness, not paying attention, or thinking of something else.</td>
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<td>3. I find it difficult to stay focused on what’s happening in the present.</td>
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<td>4. I tend to walk quickly to get where I’m going without paying attention to what I experience along the way.</td>
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<td>5. I tend not to notice feelings of physical tension or discomfort until they really grab my attention.</td>
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<tr>
<td>6. I forget a person’s name almost as soon as I’ve been told it for the first time.</td>
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<tr>
<td>7. It seems I am “running on automatic” without much awareness of what I’m doing.</td>
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<td></td>
</tr>
<tr>
<td>8. I rush through activities without being really attentive to them.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I do jobs or tasks automatically, without being aware of what I’m doing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. I find myself listening to someone with one ear, doing something else at the same time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. I drive places on “automatic pilot” and then wonder why I went there.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I find myself preoccupied with the future or the past.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. I snack without being aware that I’m eating.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## APPENDIX O. TORONTO MINDFULNESS SCALE

**Instructions:** We are interested in **what you just experienced** during the cold pressor task. Below is a list of things that people sometimes experience. Please read each statement. Next to each statement are five choices, “not at all,” “a little,” “moderately,” “quite a bit,” and “very much.” Please indicate the extent to which you agree with each statement. In other words how well does the statement describe what you just experienced, just now?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all</th>
<th>A little</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I experienced myself as separate from my changing thoughts and feelings.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. I was more concerned with being open to my experiences than controlling or changing them.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I was curious about what I might learn about myself by taking notice of how I reacted to my thoughts, feelings and sensations.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. I experienced my thoughts more as events in my mind than as a necessarily accurate reflection of the way things “really” are.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. I was curious to see what my mind was up to moment to moment.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. I was curious about each of the thoughts and feelings that I was having.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I was receptive to observing unpleasant thoughts and feelings without interfering with them.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. I was more invested in just watching my experiences as they arose, than in figuring out what they could mean.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. I approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. I remained curious about the nature of each experience as it arose.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. I was aware of my thoughts and feelings without overidentifying with them.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. I was curious about my reactions to things.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. I was curious about what I might learn about myself just taking notice of what my attention gets drawn to.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Do you have **HEADACHES** or **MIGRAINES**?

Participants are now being recruited for a study on *relaxation* /meditation*. Learn strategies shown to reduce your pain and distress, while also helping with research aimed at improving the lives of people like you.

**Open to students, staff, faculty and community members.**

Visit [personal.bgsu.edu/~mfeuill/index.html](http://personal.bgsu.edu/~mfeuill/index.html) or email Margaret (mfeuill@bgsu.edu) for details. Thank you!
Mindfulness

Have HEADACHES or MIGRAINES?

Reduce pain and distress
(PSYC students earn more than 4 Sona credits.)

Participants are now being recruited for a study on relaxation/meditation. Learn strategies shown to reduce pain and distress, and help with research aimed at improving the lives of people like you.

Open to students, staff, faculty and community members.

Visit personal.bgsu.edu/~mfeuill or email Margaret (mfeuill@bgsu.edu) for details. Thank you!
**General recruitment email:**

Hi [participant],

Thank you for your interest! I pasted more information about the study below.

If you would like to participate, please reply to this email, and I will provide you with a short online screener (2 minutes), a participant number, and some possible time slots during which you may come in for your first appointment.

Kind regards,
Margaret

Do you have headaches or migraines? Here is an opportunity to learn strategies shown to reduce pain and distress. You'll also be helping to advance research aimed at improving the lives of people with headaches and other chronic pain conditions.

The study involves relaxing or meditating for 20 minutes a day (at home, on your own time) for two weeks. At the start of the study, participants will fill out questionnaires and receive instructions in an assigned meditation or relaxation technique (45-minute appointment). After two weeks, participants will return to complete post-test assessments (45-minute appointment).

Open to students, faculty, staff and local community members.

**Concerns or questions?** See below. You may also email Margaret ([mfeuill@bgsu.edu](mailto:mfeuill@bgsu.edu)) or the research team ([bgsu.headache.study@gmail.com](mailto:bgsu.headache.study@gmail.com)).

---

**How does relaxation or meditation help with headaches/migraines? Isn't medication better?**

Large scale research studies show that relaxation strategies and some types of meditation are as effective in reducing headache frequency as the best preventive medications offered. Furthermore, there is evidence that combining medication with training in relaxation/meditation leads to better outcomes than medication alone. For the significant numbers of people who experience unpleasant side effects from medication or do not experience much benefit from medication, relaxation/meditation strategies may be an especially appealing option.

**If we already know these strategies are helpful for people with headaches, why are you studying these strategies again?**

The aim of the study is to address more specific questions about these strategies, including...
- What specific ingredients of relaxation or meditation training are critical and which are less important?
- How can we maximize the effectiveness of these strategies?
- Do these strategies work better for some people than for others? If so, why?

**The idea of relaxation or meditation seems too weird or "new-agey" to me.**

Many different kinds of people practice meditation and relaxation techniques, and these
Mindfulness techniques have been offered in medical centers as a part of multidisciplinary treatment for over two decades. The strategies taught as a part of this study have been designed to be appropriate for a range of different spiritual/religious backgrounds or lack thereof.

I don't have time to do a study like this.
Participation in this study is a significant commitment. But keep in mind that, if you find these strategies helpful, they end up saving you time by decreasing the impairment you experience as a result of your headaches. Also, while adherence to procedures is important, your data can still be very useful to the research team even if you must skip a day or two of meditation/relaxation over the course of the study.

I don't have time right now, but I might have more time later. Can I participate later?
I plan to run participants from August to December. You send me an email later when you believe you have time, or you may email now but delay your participation til a later date.

I don't want people knowing I struggle with headaches. How will you protect my confidentiality?
Participants will be assigned codes that will be used to identify forms as belonging to the same participant. Any information that could link up a person's code or data with their name or other personal information will be kept in a locked file drawer or a password protected google account. Consent forms will also be kept in a locked file drawer. (Note that participant codes will not be written on consent forms.) Only members of research team will have access to the data.

I have other questions I'm curious about, but I am still unsure about whether I want to participate.
Feel free to email Margaret at mfeuill@bgsu.edu or bgsu.headache.study@gmail.com with further questions.
For Sona Website:

Study name: Relaxation/meditation for headaches

Abstract: This study aims to better understand why these relaxation/meditation strategies are helpful for people with headaches and how to enhance effectiveness. You will be asked to meditate/relax for 20 minutes a day for two weeks. After two weeks, you’ll return to the lab to complete post-test assessments.

Eligibility requirements: Must be over 18 and pass headache screener. Only those who meet criteria will be eligible.

Sign-up restrictions: Must pass headache screener to sign up

Recruitment email for psych students

Hello everyone,

It’s time to start thinking about your research participation credit for your PSYC course. For those of you who experience bothersome headaches, I’d like to introduce you to the following opportunity. Research has shown that relaxation strategies reduce headache activity and improve well-being among migraine sufferers. Participants are needed for an upcoming study aimed at understanding why these strategies are helpful and how to enhance effectiveness. If you have bothersome headaches, this is an opportunity to learn new strategies that may improve your quality of life. You will also be providing valuable data for researchers investigating how best to help those with frequent headache.

The study involves meditating for 20 minutes a day for two weeks. Participants will need to come in at the start of the study to fill out questionnaires and receive instructions on an assigned technique. After two weeks, participants will return to complete post-test assessments.

Please contact me (mfeuill@bgsu.edu) if interested.

Thanks for your time,
Margaret Feuille
mfeuill@bgsu.edu
APPENDIX Q: PROCEDURES OUTLINE

Screening measure sent

Those who pass screener are scheduled for pre-test

Three days before pre-test session, send email with link to pre-test measures.

Ensure pre-test measures complete before training session.

Pre-test/Training Session
- Hand out informed consent
- Give summary of informed consent forms
  - Discuss any questions about forms
  - Participants sign informed consent forms
- Ensure participants don’t have circulatory problems/ Raynaud’s disease
- Assign code numbers
- Hand out pre-test survey packet (Demographics, HIT-6, HMSE, DSE, PHQ-9)
- Complete pre-test
- Pass around sign up sheets for second appointment times (Teach appropriate lesson plan to each group—see scripts
- Give technique handouts
- Answer any questions
- Explain purpose of the diaries, how to fill them out, importance of diaries

Pre-test RA sends out emails regarding daily diaries, reminder emails if dairy 0 is not complete on time, and another email on Day 7 to give post-test date and remaining daily diary links.

Post-test RA sends out reminder email 3 and 1 day prior to post-test session.

Post-test session
Show participants to individual room and seat the in recliner
1. Explain procedure of the second session (see post-test session script)
2. Remind them of informed consent
3. Participants perform their technique for 20 minutes
4. Give cue for participants to initiate CP task
   After completion of the CP task, complete post-test survey packet: containing the TMS, STAI-stat, manipulation check questions, GAD-7, PHQ-9, HMSE, DSES, the M scale, EBS, and MAAS.
5. Turn in adherence diaries
6. Debrief participant and provide headache referrals if requested
APPENDIX R: SCRIPT FOR RELAXATION GROUP

Today we will be teaching you a technique to help you relax and improve your concentration, which in turn may help you reach a variety of worthy goals. Some of these goals are particularly relevant for people with migraines. For instance, research shows that this practice improves pain tolerance and well-being. However it is more than a means to an end: it may help you relax and restore yourself in this very moment.

What you will be doing is sitting quietly with your eyes closed, relaxing your muscles, and calming your mind.

[start timer: for this script you need to draw things out as much as possible]] Let’s practice for a few minutes. <pause>

First, settle into a comfortable sitting position <pause> sitting with your back straight against the back of the chair <pause> your legs uncrossed <pause> your feet flat on the floor <pause> and your hands in your lap. Now close your eyes.

[Pause for 3 breaths]

As you begin this exercise, acknowledge that this practice requires discipline and motivation. <pause> Prepare your mind for this exercise by recalling its purpose, to help you quiet your mind and restore yourself.

[Pause for 3 breaths]

Now relax your body

[Pause for 1 or 2 breaths]

Releasing the tension from your muscles.
[Pause for 5 breaths.]

Let your worries and concerns fall away,

[pause for 2 breaths]

and let your mind grow calm.

[Pause for 5 breaths]

Just stay with this <pause>, continuing to calm yourself, <pause><pause> releasing tension <pause> <pause> and quieting your mind.

[Pause for 5 breaths]

Continue for a few more minutes.<pause> I’ll let you know when to open your eyes.

[Let timer run up to 5 or 6 minutes.]

[When a total of 10 minutes have passed, say:] “Now you may open your eyes. [pause] How did that feel? [Discuss the experience] Do you have any questions?
APPENDIX S: HANDOUT FOR RELAXATION GROUP

Outline of training: PARTICIPANT # ________

This technique can help you . . .

- relax
- improve your concentration
- improve pain tolerance
- foster well-being
- restore yourself

What you will be doing...

- sitting quietly
- eyes closed
- relax your muscles
- calm your mind

Let’s practice . . . (10 minute practice session)

- sit comfortably
- close your eyes
- remind yourself of your intention
- relax muscles
- calm your mind
APPENDIX T. REGULAR MINDFULNESS SCRIPT

Today we will be teaching you a technique to help you relax and improve your concentration, which in turn may help you reach a variety of worthy goals. Some of these goals are particularly relevant for people with migraines. For instance, research shows that this practice improves pain tolerance and well-being. At the same time this practice is more than a means to an end—it’s about becoming more engaged in your experience in this very moment.

Often in our daily lives we are so caught up in the future, the past, and in our own thoughts that we lose touch with what is actually happening right now. With this technique we can learn to experience the present more directly, without the stories and distortions which often blur our view. We may also learn to take more time with our actions, choosing responses more carefully rather than reacting automatically. In this way this practice can help you deal more effectively with stressors and discomfort, while also making your daily life more vivid and enjoyable.

What you will be doing is observing your breath and all the sensations associated with breathing. When you notice your mind slipping into other areas of thought, you’ll note what is on your mind and gently bring your attention back to the breath. This will become clearer in the guided meditation we will do together.

It’s no accident that this technique is centered around breathing. The gentle rhythm of the breath naturally calms the mind, allowing us to pay closer attention to what’s happening right now. Breathing is also an essential bodily function, and by tuning into the breath we may remind ourselves of the way it sustains our lives and fills us with energy. Another reason that a focus on the breath can be beneficial is that the breath is with you wherever you go, and so, by tuning into your breath, you can access this sense of vitality and inner calm at any time.
Mindfulness

Some have compared the practice of this technique to dropping underneath the surface of the ocean. In everyday life you can be caught up in turmoil, in events around you and your own thoughts, like a small boat being tossed at the surface of the ocean. But by developing this frame of mind, you may drop underneath your thoughts to the calmer water deeper down, where you may find a sense of calm and clarity and grow closer to who you are.

[start timer] Let’s practice together for a few minutes. First, settle into a comfortable sitting position, with your back straight against the back of the chair, your legs uncrossed, your feet flat on the floor and your hands in your lap. Now close your eyes.

As you begin this exercise, acknowledge that this practice is sometimes pleasant and sometimes not and requires discipline and motivation. Prepare your mind for this exercise by recalling its purpose, to really pay attention to the present moment, finding a sense of calm in everyday experience.

**PAUSE FOR 1 or 2 BREATHS**

Ask yourself, “What is my experience right now? What am I thinking about? What am I feeling emotionally? What sensations are present in my body?” Just observe your experience, whatever it is.

**PAUSE FOR 2 or 3 BREATHS**

Now bring your attention to the changing physical sensations in your lower abdomen as the breath moves in and out of your body. To help you pay attention to your breathing, place your hand on your lower abdomen, and become aware of the changing sensations where your hand makes contact with your belly. When you’ve tuned in to these sensations, you can remove your hand if you like, and continue to observe the sensations in your belly.

**PAUSE FOR 2 BREATHS**
As you attend to your breathing, allow yourself to feel that the breath represents a source of calm, focus and energy within you. It may help to remind yourself of the way the breath sustains your body every moment of every day.

**PAUSE FOR 2 BREATHS**

Continuing to follow the breath, focus your awareness on the sensations of slight stretching as the belly rises with each inbreath, and of gentle deflation as it falls with each outbreath, perhaps also noticing the slight pause at the end of the inbreath, and the slight pause between the end of one outbreath and the beginning of the next inbreath. There is no need to control the breathing in any way—allow it to be just as it is. As best you can, also bring this sense of allowing to the rest of your experience, even to those aspects of your experience that may be unpleasant. (*I added the pauses here because I felt as I read it that the sentence rolled off kind of awkwardly, I feel like the pauses might break it down better*).

**PAUSE FOR 5 BREATHS**

Sooner or later your mind will wander away from the focus on the breath to thoughts, feelings, or daydreams. This is perfectly OK, it’s what minds do. When you notice that your awareness is no longer on the breath, acknowledge briefly where the mind has been, perhaps using a quiet label, like thinking, or feeling, or itchy. Then, gently bring your awareness back to the breath.

**PAUSE FOR 5 BREATHS**
You may find that your mind often wanders. If a certain thought or feeling persists, don’t push it away. Just keep acknowledging, and gently returning to the breath. Remember there is no need to be frustrated. This wandering and returning is part of the technique. As your attention leaves the breath and returns, see if you can settle into a sense of calm and clarity, all around you, moving through you, with every breath in, and every breath out.

**PAUSE FOR 5 BREATHS**

Simply continue to follow the breath, noting what is on your mind when it wanders, and then gently bringing it back to the breath. I’ll let you know when to open your eyes.

[let time run until up to about 7 minutes]

*From Arche and Craske (2006), adapted from Segal, Williams, & Teasdale (2002)*
This technique can help you . . .

- relax
- improve your concentration
- improve pain tolerance
- foster well-being
- become more engaged in present experience
  - choose responses rather than react automatically
  - deal more effectively with stressors
  - make daily life more vivid, enjoyable

What you will be doing . . .

- observing your breath
- when minds wanders . . .
  - note what is on your mind
  - gently return attention to the breath

This technique is centered around breathing . . .

- gentle rhythm
- an essential bodily function

A metaphor: dropping underneath the ocean’s surface:

- finding a sense of calm and clarity
- growing closer to who you are

Let’s practice . . .

- sit comfortably
- close your eyes
- remind yourself of your intention
- watching your breathing
- noting your thoughts, feelings, sensations
- keep returning to the breath
Instructions for your technique

Once a day for the next two weeks follow the instructions on this page. Remember to fill out the diary in the evening of each day.

For the first two days of your practice, please take a few minutes to look over this sheet before you start to ensure that you practice the technique correctly.

1. Prepare. Slow down and gently transition into your meditation,

   Seat yourself in an environment free of distraction. Set an alarm for 20 minutes, or note the start time and check the clock to be sure you sit for 20 minutes total.

   Close your eyes.

   Recall your intention: to become more engaged in your present experience.

   Recall the significance of the breath. Remind yourself of its calming gentle rhythm, the way its life-sustaining function.

2. Tune into your breathing. Let your attention turn to the breath.

   Observe the sensations of breathing. You might notice: slight stretching as the abdomen rises with each in breath, gentle deflation as it falls with each outbreath, the slight pause between breaths. Allow the breath be natural.

3. Wander and return. Your mind will naturally wander away from the breath. Each time it does, acknowledge where it was, and then gently return to your breath.

   Note what is on your mind. You might give quiet labels to whatever pulls for your attention, such as thinking, itching, tingling.

   No need for frustration. If a certain thought or feeling persists, don’t push it away. Just keep acknowledging it and gently returning to the breath. The wandering and returning is part of the technique.

   Continue this until the twenty minutes are up.

   Evening: Complete short questionnaire (“daily diary”)
APPENDIX V: SPIRITUAL MINDFULNESS SCRIPT

Today we will be teaching you a technique to help you relax and improve your concentration, which in turn may help you reach a variety of worthy goals. Some of these goals are particularly relevant for people with migraines. For instance, research shows that this practice improves pain tolerance and well-being. At the same time this practice is more than a means to an end—it’s about spiritual connection, feeling that you are closer to something sacred to you.

Different spiritual traditions may refer to this technique and similar practices using their own language and framework. Traditions centered around God or a divine figure, such as Christianity and Judaism, may describe this as “practicing the presence of God”—in other words, learning to feel God’s closeness to you in everyday life. Traditions with less emphasis on divinity, such as Buddhism, see this practice as getting in touch with our spiritual core or Buddha nature, which refers to the goodness and compassion that they believe is our true self. Note, however, that this practice requires no particular set of spiritual beliefs, nor does it require belief in any literal spiritual reality for that matter.

What you will be doing in this technique is observing your breath and all the sensations associated with breathing. When you notice your mind slipping into other areas of thought, you'll note what is on your mind and gently bring your attention back to the breath. This will become clearer in the guided meditation we will do in a few minutes.

It’s no accident that this technique is centered around breathing, which is associated with spirituality across traditions. For instance, according to the Genesis creation story, God creates humans by filling them with the breath of life. As another example, Christians sometimes refer to the Holy Spirit as the breath of God, making our breath a representation of the divine spark inside us. Similarly, Buddhists understand the breath as a reminder of our connection with all living beings and our unity with the whole world. In fact, many languages use the same or similar word for breath, spirit and life, including English: the English words spirit and spiritual are derived from the Latin word spiritus, which means breathing, as well as life and soul.
Some have compared the practice of this technique to dropping underneath the surface of the ocean. In everyday life you may be caught up in turmoil, in events around you, and your own thoughts, much like a small boat tossed at the surface of the ocean. But by developing this frame of mind, you may drop underneath your thoughts to the calmer water deeper down, where you may grow closer to a mystery that is within you and around you, even when you are not aware of it.

Let’s practice together for a few minutes. First, settle into a comfortable sitting position, with your back straight against the back of the chair, your legs uncrossed, your feet flat on the floor, and your hands in your lap. Now close your eyes.

As you begin this exercise, acknowledge that this practice is sometimes pleasant and sometimes not and requires discipline and motivation. Prepare your mind for this exercise by recalling its purpose, to grow closer to something or someone sacred, something fundamental to what it means to be alive. Take a moment to bring to mind this spiritual purpose in a manner that is consistent with your own understanding. If you find it helpful, you may say a prayer, or you might remind yourself that, in this practice, you walk the same path that human beings have been walking for thousands of years, seeking deeper meaning and spiritual connection.

Pause for 2 or 3 breaths

Ask yourself, “What is my experience right now? What am I thinking about? What am I feeling emotionally? What sensations are present in my body?” Just observe your experience, whatever it is.

Pause for 2 or 3 breaths

Now bring your attention to the changing physical sensations in your lower abdomen as the breath moves in and out of your body. To help you pay attention to your breathing,
place your hand on your lower abdomen, and become aware of the changing sensations where your hand makes contact with your belly. When you’ve tuned in to these sensations, you can remove your hand if you like, and continue to focus on the sensations in your belly.

**PAUSE FOR 2 or 3 BREATHS**

As you attend to your breathing, allow yourself to feel that the breath embodies whatever is sacred to you. It may help to remind yourself of the spiritual significance of the breath across traditions. For instance, recall that in Genesis God creates humans by filling them with his breath, and that Buddhists see in our breath the same basic processes that characterize what it means to be alive.

**PAUSE FOR 2 BREATHS**

Continuing to follow the breath, focus your awareness on the sensations of slight stretching as the abdomen rises with each inbreath, and of gentle deflation as it falls with each outbreath, perhaps also noticing the slight pause at the end of the inbreath, \(\text{pause}\) and the slight pause between the end of one outbreath \(\text{pause}\) and the beginning of the next inbreath.\(\text{pause}\) There is no need to control the breathing in any way—allow it to be just as it is. As best you can, also bring this sense of allowing to the rest of your experience, even to those aspects of your experience that may be unpleasant. (*Added pauses for the same reason as given in Version B*)

**PAUSE FOR 3 BREATHS**

Sooner or later your mind will wander away from the focus on the breath to thoughts, feelings, or daydreams. This is perfectly OK, it’s what minds do. When you notice that your awareness is no longer on the breath, acknowledge briefly where the mind has been, perhaps by using a quiet label, like thinking, or feeling, or itchy. Then, gently bring your awareness back to the breath.
**PAUSE FOR 3 BREATHS**

You may find that your mind often wanders. If a certain thought or feeling persists, don’t push it away. Just keep acknowledging and gently returning to the breath. Remember there is no need to be frustrated. The wandering and returning is part of the technique. As your attention leaves the breath and returns, see if you can feel yourself growing closer to something sacred, something really real, all around you, moving through you with every breath in, and every breath out.

**PAUSE FOR 5 BREATHS**

Simply continue to follow the breath, noting what is on your mind when it wanders, and then gently bringing it back to the breath. I’ll let you know when to open your eyes.

*Let time run until about 7 minutes.*
APPENDIX W: HANDOUT FOR SPIRITUAL MINDFULNESS

Outline of training

This technique can help you . . .

- relax
- improve your concentration
- improve pain tolerance
- foster well-being
- grow closer to the sacred, whatever that is for you
  - example for theists*: “practicing the presence of God”
    *theist: believes in God/higher power
  - example for non-theists**: making contact with your true self
    **non-theist: does not believe in God/higher power

What you will be doing . . .

- observing your breath
- when minds wanders . . .
  - note what is on your mind
  - gently return attention to the breath

This technique is centered around breathing . . .

- breath is often associated with spirituality
- examples for theists: Genesis creation story, breath of God
- example for non-theists: unity with all living things and the world around us

A metaphor: dropping underneath the ocean’s surface:

- growing closer to a mystery within you and around you

Let’s practice . . . (10 minute practice session)

- sit comfortably
- close your eyes
- remind yourself of your intention
- watching your breathing
- noting your thoughts, feelings, sensations
  - keep returning to the breath
Instructions for your technique

Once a day for the next two weeks follow the instructions on this page. Remember to fill out the diary in the evening of each day.

For the first two days of your practice, please take a few minutes to look over this sheet before you start to ensure that you practice the technique correctly.

1. **Prepare.** Slow down and gently transition into your meditation,

   Seat yourself in an environment free of distraction. Set an alarm for 20 minutes, or note the start time and check the clock to be sure you sit for 20 minutes total. Close your eyes.

   Recall your intention – growing closer to the sacred, something really Real – in a manner consistent with your own understanding

   Recall the spiritual significance of the breath. Remind yourself of the connection between breath and spirit across cultures—for instance, you may think of the breath as embodying a divine spark within you, or representing your unity with the world around you.

2. **Tune into your breathing.** Let your attention turn to the breath.

   Watch the sensations of breathing. You might notice: slight stretching as the abdomen rises with each in breath, gentle deflation as it falls with each outbreath, the slight pause between breaths. Allow the breath to be natural.

3. **Wander and return.** Your mind will naturally wander away from the breath. Each time it does, acknowledge where it was, and then gently return to your breath.

   Note what is on your mind. You might give quiet labels to whatever pulls for your attention, such as, thinking, itching, tingling.

   No need for frustration. If a certain thought or feeling persists, don’t push it away. Just keep acknowledging it and gently returning to the breath. The wandering and returning is part of the technique.

   Continue this until the twenty minutes are up.

**Evening:** Complete short questionnaire (“daily diary”)

B 072611
APPENDIX X: ONE- AND TWO-WEEK CHECK-IN APPENDED TO DIARIES 7 AND 13

Please answer the following with respect to the past week.
During the past week, did you (intentionally tune into your breathing/use your relaxation technique) outside of the daily formal practice periods?
   not at all; once or twice; three to five times; 6 or more times;
If you did use your technique outside of the formal practice, please indicate the circumstances.
   - to manage a headache
   - to cope with a stressful experience, such as an argument or an upcoming test
   - to appreciate a quiet or pleasant moment
   - other: (please describe)

Please comment on your experience of the technique thus far.
APPENDIX Y: CHECK LIST FOR PRE-TEST RAs

Subject number:

Before Day 0  Tentative Training Date__________  RA__________
- Screening measure sent
- Screening measure passed (If no, subject disqualified)
- Training timeslot chosen (once done, please fill above)
- RA performing training chosen (once done, please fill above)
- RA conducting training informed.

2 Days Before Training  Date:__________
- Training reminder email and link to pre-test sent

1 Day Before Training  Date:__________
- Check if pretest was completed.
- If pretest not completed, reminder email sent.

Day of Training (Before Training)
- Check if pretest was completed
- If pretest was not completed, reschedule and modify previous information

Day Of Training (After Training)  Training Date:__________  RA__________
- Please fill out confirmed date of training
- Please name RA who gave the training
- Fill out columns B-J of post test document
- Send email with diaries 0-6

Day 2
- Check if Day 1 Diary completed.
- If diary not completed, reminder email sent.

Day 7
- Diaries 7-13 and post-test reminder date emailed.  Post-test date__________

Day 11
- Recheck post-test document filled out.

Day 14-16
- Credit was assigned, if applicable
This is Margaret with the Stress and Headache study. Thank you for your interest in participating! Here is a link to a screening measure you will need to take prior to enrolling in the Stress and Headache Study (if clicking the link doesn’t work, copy and paste into your browser):

http://www.surveygizmo.com/s3/570876/Screener

Your participant number is [number]. Please provide it when prompted.

Thank you!
Margaret
APPENDIX AA: PRE-TEST REMINDER AND PRE-TEST SURVEY LINK
Subject line: Stress and Headache study

Hello [participant],

I'm [your name], a research assistant for the Stress and Headache Study. I'm emailing you to let you know that your training has been scheduled for [day, date, time]. We'll meet at room 430 of the psychology building.

Also, please keep an eye out for an email from me about two days before your training appointment. At that time I'll email you with a 20-minute online survey that you should complete before coming in for your training appointment.

Don't hesitate to contact me with questions. Thanks again for signing up!
[your name]

Hi [participant],

Great! The next step is to complete a short questionnaire which you can find by clicking the link (if the link doesn't work, copy and paste it into your browser).

http://www.surveygizmo.com/s3/570876/Screener

Your participant number is [number]. Please be sure to enter it when prompted.

After completing the screener, please reply to this email indicating which of the following dates/times that you could attend a training--see below. Once I hear from you regarding training times, I'll let you know the exact date/time. Please let me know if none of the times below work for you and we'll work on finding another time.

Thank you! Don't hesitate to contact me with questions or concerns.
Margaret

Possible training appointments
[list]
APPENDIX AB: DIRECTIONS FOR DAY OF TRAINING

MATERIALS:
[list materials you’ll need]: Number of chairs needed for entire group, informed consent docs, sign-up sheets for second appointment.

STEPS:
2. Give summary of informed consent forms.
3. Ask/Discuss any questions about forms.
   - Describe basic of procedure:
     - training in a stress-reduction technique
     - practice once a day for two weeks, fill out daily diary
     - come back for a post-test procedures including a cold water task, where you hold your hand in cold water for a period of time until it becomes too uncomfortable.
     - We’ll protect your confidentiality; you are assigned participant numbers in part t protect your confidentiality. Your data will be associated only with your participant number and not your name. Documents linking your name to your participant number including emails- which you may want to double delete and a spreadsheet in a password protected email account. Only research assistants and P.I. will have access to this account.
     - Remember you can drop out or skip items if your uncomfortable answering them
4. Participants sign informed consent forms- COLLECT FORMS
5. Pass around sign up sheets for second appointment times
   “I’m going to pass around a sign-up sheet and everyone can sign up for a time to come into the lab to complete the test in two weeks. Please only sign up with one person per time slot, and write down your time so that you will remember. Are there any questions?”
6. Answer any last questions
7. Randomize participants to conditions
   - Use sheet “assigning participants to conditions” and also fill out your own treatment condition sheet
   - Call out names for a given condition and guide them to one room, call out names for the next condition and guide them to another room.

PART 2: Training separate conditions

MATERIALS: enough chairs, possible, handouts

STEPS:
1. Label handout packet with participant numbers (see top right corner)
2. Give out packet- say something like:::
   “I’m going to be doing a lot of reading in the next ten minutes so I’m giving you this handout to give you an idea of what we’re going to do and to keep track of where we are. Notice that we are going to start with [quickly run through headings]. If it helps please follow along with the handout as I talk. Okay? Now I’ll go ahead with the script.”
3. Teach appropriate lesson plan to each group—see your individual script.

4. After teaching the appropriate meditation, go through “Study Calendar”, and “Instructions for your technique.” Also show them page with daily diary links.

**AFTER TRAINING:**
- be sure you’ve recorded the conditions participants have been assigned to, enter this information into google spreadsheet “pre-test participant info”
- alert post-test RA to their upcoming appointment
- fill out relevant columns of “post-test participant info”: you can find handedness by looking in survey gizmo
- send out **Day 0** email to participants—be sure to send correct email for the condition the participant is in.
APPENDIX AC: ASSIGNING PARTICIPANTS TO CONDITIONS
Instructions: List participants for a given day alphabetically (first name) starting where last RA
left off from the previous training. Leave this packet in room 435.

<table>
<thead>
<tr>
<th>Condition</th>
<th>First name</th>
<th>Participant number</th>
<th>Research assistant</th>
<th>Date</th>
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<tbody>
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</table>

Key: A = Regular m.  B = Spiritual m.  C = Relaxation
“Now you may open your eyes. [pause] How did that feel? [Discuss the experience] Do you have any questions?

Now please turn to the second page of your packet that says “study calendar” at the top. This page walks you through procedures for the next two weeks. As you can see on the sheet, after training today, you’ll receive an email with links to short online questionnaires—called daily diaries—that you’ll be asked to complete daily for the next week. Then on day 7 you’ll receive a similar email with links for daily diaries 7 through 13. Each should take under 3 minutes to complete. Note that the best time to fill out these questionnaires is in the evening. The next best time would be the following morning. Also note that daily diaries are numbered starting with today as day 0, tomorrow as day 1 etc.

Also, as you can see on the handout, we would like you to set aside twenty minutes each day—starting tomorrow—to practice the technique you just learned. If you turn to the following page of your handout, you’ll find instructions outlining your technique. For the first two days you practice your technique, please take a moment to look over these instructions before you start. Note you may keep time by setting a timer or simply by noting the start time and checking the clock to be sure you sit for the full 20 minutes. You can practice anytime during the day, as long as you are able to find the quiet time to do it. People often find it helpful to practice around the same time every day, but that isn’t required.

You may also find it helpful to use your technique at other times besides the 20 minutes you set aside for formal practice. For instance you might use your technique to help you manage something stressful, to cope with a headache, or to appreciate a quiet moment.

Are there any further questions?
Remember: Today you’ll receive an email with links to the short questionnaires we want you to complete each day. Starting today you’ll complete one of these short questionnaires each evening. Starting tomorrow you will practice your technique every day for 2 weeks until your post-test appointment.
APPENDIX AE: STUDY CALENDAR PROVIDED TO PARTICIPANTS

Day 0:
- Attend training
- Receive email from research assistant with diaries for days 0 through 6
- Evening: fill out online questionnaire for day 0 (“daily diary 0”)

Day 1:
- Practice for 20 minutes: use handout #2 to help you
- Evening: fill out online questionnaire for day 1 (“daily diary 1”)—refer to Day 0 email for link

Days 2 through 6: Same as day 1

Day 7:
- Receive email from research assistant with diaries for day 7 through 13
- Practice for 20 minutes
- Evening: fill out online questionnaire for day 7 (“daily diary 7”)

Day 8:
- Practice for 20 minutes
- Evening: fill out online questionnaire for day 8 (“daily diary 8”)—refer to Day 7 email for link

Days 9-13: same as day 8

Day 14 (or 15):
- attend post-test session (room 435 of Psychology Building)
Hello [participant],
This is [RA name] with the Stress and Headache study. Thank you for coming in today! Now that you have been instructed on how to practice your technique we would like you to answer a few questions about your day. Please follow the link at the bottom of the page for the Day 0 diary. Recall that your participant number is [number]. Please be sure to provide it when prompted.

Recall that we would like you to continue to complete some questions (i.e., “daily diary”) each day for the remainder of the study. Tomorrow, your first day of formal practice, will be day 1, the following day will be day 2 and so on. We’ve provided links for the diaries up to day 6 below. On day 7 you’ll receive an email with the links to diaries for days 7 through 13.

A few things to note:
1. It is ideal to complete diaries in the evening of the day they refer to, as your answers are more likely to accurately reflect your experience on a given day. (Next best would be the following morning, answering the questions as if you were filling them out on the day they are meant to refer to.)

2. Below I’ve provided instructions from the handouts you received today for your reference.

3. Remember to mark your calendar for the post-test session you signed up for on [date, time, day of week]

If you have any questions, concerns or comments, please feel free to email me. Thank you for taking the time to provide us with this useful information about your experience over the course of the study!

Best,
[your name]

[daily diary links]
[reminder of participant number]
APPENDIX AG: EMAIL SENT IF DIARY 0 NOT COMPLETED ON TIME

According to our records, it looks as though you have not completed Daily Diary 1. Here is a quick reminder to try to complete most diaries by the evening of the day they refer to, or the next morning. Even if you do not have a chance to do the 20 minutes of practice, filling out the daily diary is still very helpful to us. It is particularly important that you complete Diaries 1, 2, 7, and 13. Thank you!

Then paste original Day 0 email below.
Hello [participant],

This is [RA] with the Stress and Headaches study. You have been practicing your relaxation technique and filling out daily diaries for one week now and we would like to take the time again to thank you for your participation in our study. We ask that you continue to practice your technique and complete your daily diaries for the next seven days, leading up to the follow-up session you have previously scheduled with us.

Remember, your follow-up session is on [day, date, time] in room 435 of the Psychology Building.

Below I have attached the links to the daily diaries for the next seven days, including your diary for [Day, Date] (Diary 7). Remember the best time to fill out the diary is in the evening of the day they refer to, as your answers will more accurately reflect your experience for that day.

Recall that your participant number is [participant number]. Please provide it when prompted.

I have also included at the bottom of this email the instructions for your daily practice again if you need it, as well as a timetable for the rest of the study.

We would like to remind you that if you have encountered any problems while practicing your technique or while filling out your daily diaries, or have any general questions you would like answered, to please let us know. You can email me back with any questions or concerns that you have. Also keep in mind that if you ever feel too uncomfortable to continue the study you can still opt-out of it at any time.

We greatly appreciate your participation in this study!

Thank you for your time,

<RA name>

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[daily diary links]
Participant number is [participant number]
APPENDIX AI: SAMPLE REMINDER EMAIL SENT BY POST-TEST RA

Hello [participant],

This is [RA] with the Stress and Headache study. I will be running your post-test appointment, scheduled for [day], [date] at [time] in room 435 of the Psychology building. I'll send you another email the evening right before your appointment as a reminder.

I also want to be sure that this time still works for you. If it does not, please let me know so that we can get you rescheduled for another time as soon as possible.

Thank you!

Kind regards,
[RA]
Thank you for your participation in this study! This study was designed to examine the relationship between mindfulness, spirituality, and pain. Mindfulness meditation—briefly, learning to pay attention to present-moment experience—is a technique that has shown some promise in improving the lives of people with migraines and other chronic pain conditions.

There were three treatment groups that participants were assigned to—the regular mindfulness group, the spiritual mindfulness group, and the relaxation group. The regular mindfulness group did a mindfulness-of-breathing meditation, in which they were asked to attend to sensations of breathing. The spiritual mindfulness group did a spiritual version of the mindfulness-of-breathing meditation, which instructed participants to use their own spiritual beliefs and background in the meditation. The relaxation group received instructions simply to calm the mind and release tension in the muscles.

Pre-test and post-test measures were designed to assess how the intervention affected you psychologically and spiritually, as well as how the intervention affected headache outcomes and pain tolerance. The last task you performed—the cold pressor task, was designed to test pain tolerance and has been used in many other studies to help researchers understand the experience of pain and how to help people with chronic pain. The length of time you hold your hand in the water gives us an idea of how well the meditation or relaxation strategy you were assigned to was working for you in terms of helping you deal with pain and other stressors.

If you have further questions or concerns, or you would like to be kept informed of the results of the study, please email Margaret Feuille (mfeuill@bgsu.edu; 818-439-4874). Also please contact Margaret if you would like a referral for help you with your headaches and related distress.
APPENDIX AK: HSRB APPROVAL
The Human Subjects Review Board (HSRB) has reviewed the requested modifications you submitted for your project involving human subjects. Effective August 9, 2011, the following modifications have been approved:

1. Addition of measures to the study—greatest concern is a depression measure with an item assessing thoughts about self harm.
2. Have participants complete pre-test measures online prior to coming in for the meditation/relaxation training (electronically signing consent form).
3. Have participants complete daily diaries online.
4. Participants will be asked during debriefing for their permission to be contacted in a year to collect follow-up data.
5. Research team collect data a year from now using the HIT-6, GAD-7, PHQ-15, PHQ-9. Also ask questions about whether and how often they use the strategies learned as part of the study.
6. Addition of Measures of a daily measure, state anxiety (STAI-S), mindful awareness during the cold pressor task, trait mindfulness and headache management self efficacy.
7. Questions assessing comprehension added to the two mindfulness conditions to evaluate the effectiveness of training procedures. Corrective feedback given to help ensure that participants understood main points of their respective training scripts.
8. Modified consent form to reflect changes.
9. In addition to recruiting subjects through email, Sona, and flyers around campus at the health center, recruit by posting an ad on craigslist, creating a facebook page, posting flyers in the community (e.g., at Panera), and advertising throughout eh wellness connection (Stall Talk and WellAware)

You may proceed with subject recruitment and data collection.

The final approved version of the consent document(s) is attached. The consent document(s) bearing the HSRB approval/expiration date stamp is the only valid version and, if it is a revision to previously approved document(s), supercedes those versions. Copies of the dated document(s) must be used in obtaining consent from research subjects.

If you seek to make any additional changes in your project activities, complete the Request for Modifications/Addendum application and submit it to the HSRB via this office. Please notify me in writing upon completion of your project (final report would be helpful).
APPENDIX AL: INFORMED CONSENT

Informed Consent

Introduction: I am Margaret Feuille, a clinical psychology graduate student at BGSU, and my advisor is Dr. Kenneth Pargament. I am conducting a study on the effects of relaxation and meditation techniques on people with migraine headache.

Purpose: Research has shown that relaxation and meditation techniques reduce headache activity and improve well-being among migraine sufferers. This study will examine why these strategies are helpful and how to enhance effectiveness. Your participation in this study will contribute to a growing literature on behavioral strategies for managing and treating chronic pain. Participants assigned to the active treatment condition are likely to experience reduced headache activity and improved well-being as a result of their participation.

Procedure: Should you decide to participate, your involvement in the study starts with your filling out online pre-test assessments, including questionnaires on demographics and headache activity. Next you will receive training in a relaxation/meditation technique. While material in today’s session will address spirituality, this study has been designed to be appropriate for any type of spiritual belief or lack thereof, and there will be no attempt to alter your current religious or spiritual beliefs or orientation. Many different kinds of people practice meditation and relaxation techniques, and these techniques have been offered in medical centers as a part of multidisciplinary treatment for over two decades.

During the two weeks which follow your training, you will be asked to practice your technique for 20 minutes every day and to fill out an adherence diary each day. At the end of the two weeks, you will be asked to return to the lab for another hour to fill out questionnaires and to participate in the cold pressor task, an assessment technique commonly used in laboratory studies of pain. What you will be asked to do is place your hand in ice-water up to the wrist and hold it until it becomes too uncomfortable, at which point you should remove your hand. While designed to be mildly painful, this procedure is quite safe. Also, pain level mounts gradually, and you may remove your hand at any point you choose to. You will be allowed to hold your hand in the water up to five minutes, at which time you will be asked to remove your hand.

At the end of the post-test appointment you’ll be asked if you are interested in participating in a follow-up study planned for a year from now. Follow-up will involve completing a 10 to 20 minute online survey on your current functioning. If you plan to leave BGSU within the next year, we will ask you for your phone number to facilitate getting in contact with you. This information will be kept confidential as well the rest of your data—see below.

Voluntary nature: Your participation is completely voluntary. You are free to withdraw at any time. You may decide to skip questions (or not do a particular task) or discontinue participation.

BGSU HSRB - APPROVED FOR USE
ID # H11T055557
EFFECTIVE 8/9/11
EXPIRES 8/8/12
at any time without penalty. Deciding to participate or not will not affect your academic standing or your relationship with Bowling Green State University.

**Confidentiality Protection:** Participants will be assigned codes that will be used to identify forms as belonging to the same participant. Any information that could link up a person’s code or data with their name or other personal information will be kept in a locked file drawer or a password-protected electronic spreadsheet. This would include consent forms (although participant codes will not be written on consent forms). Only members of the research team will have access to the data.

**Risks:** Risks include discomfort experienced during the cold pressor task. However this task is generally considered quite safe and discomfort after the task is over is unlikely (see procedure section). Those with circulation problems (such as Raynaud’s disease) should not participate. In the unlikely event that you experience problems after the task, you should seek medical care, and you will need to pay associated costs.

**Contact information:** Please contact Margaret Feuille (mfeuill@bgsu.edu; 818-439-4874) or Dr. Pargament (kpargam@bgsu.edu; 419-372-8037) if you have any questions about the research or your participation in the research. You may also contact the Chair of the Human Subjects Review Board at 419-372-7716 or hsrb@bgsu.edu, if you have any questions about your rights as a participant in this research. Thank you for your time.

Please note that only those 18 or older may consent to participate.

____________________

Participant signature