STRESS, DISTRESS, MEDITATION, AND MINDFULNESS

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For the Natster, who is always on my mind.

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ABSTRACT

The effects of mindfulness and meditation on the relationship between life event stress and distress symptoms were examined. Five hypotheses were tested: mindfulness as a moderator of stress and distress, meditation as a moderator of stress and distress, life event stress as negatively predicting mindfulness and meditation as a moderator of this effect, mindfulness as a mediator of stress and distress, and mindful observation as a moderator of stress and distress differentially among meditators and non-meditators. Main effects consistent with previous studies were found. Mindfulness was shown to mediate between stress and distress in a manner consistent with Baron & Kenny (1986). The nonjudgment portion of mindfulness moderated the stress-distress relationship only when each was accounted for. Mindful observation moderated the stress-distress relationship differentially by meditation status as predicted: highly observant persons who meditated showed a significantly weaker relationship between life event stress and distress than all other groups when life event stresses were high. Implications and directions for future studies are discussed.

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INTRODUCTION

Meditation has for decades been reported to improve quality of life (Goleman, 1971). More recently, a particular kind of meditation that emphasizes broad nonjudgmental awareness, or mindfulness, has gained popularity both in the laity and in psychological research and clinical applications (Kabat-Zinn, 1990). What mindfulness is, how it is developed in meditation, its relationship with certain types of stressors, and its apparent ability to reduce distress are the subject of the current research.

Stress and Distress

One way of examining quality of life is to look at how much stress and distress an individual experiences. Colloquially and in much of popular psychology, "stress" often refers to phenomenology as much as environmental forces (Sapolsky, 2004). A person might say about an event, "that was so stressful" and yet also say about herself, "I felt so stressed," conflating objective cause and subjective effect. However, use of the term in psychological research was originally adopted from engineering, in which it referred specifically to external forces acting upon an object, such as gravity acting upon a bridge (Holmes & Rahe, 1967). To distinguish external forces from their effects, the term "distress" has been adopted to refer to the latter (Derogatis & Melisaratos, 1983; Holmes & Rahe, 1967), although this is not entirely consistent across the literature (Rabkin &

Struening, 1976). For the purposes of the current research, "stress" refers to external forces acting upon an individual, such as situational context, physical insult, or social demands, and "distress" refers to the individual's response to that stress, which may include symptoms like anxiety, insomnia, depressed mood, worry, etc.

One subset of stressors common to all individuals consists of significant events in one's life, what we think of as life's milestones, such as births and deaths, occupational gains and losses, marriage and divorce, and the like. Significant life events have been argued to act as stressors simply by virtue of the change that they precipitate (Cohen, Kamarck, & Mermelstein, 1983; Frazier & Schauben, 1994; Holmes & Rahe, 1967; Rabkin & Struening, 1976; Rahe, 1975, 1976). For example, although getting married is generally considered a positive thing, nonetheless wedding planning, development of new relationships with in-laws, and settling in to new routines with a spouse can, even when pleasant, require a good deal of time and energy and therefore increase the stress on an individual. Consistent with this idea, frequency of life events correlates with frequency and/or severity of distress symptoms at roughly $r = .20$ to $r = .30$ (Cohen et al., 1983; Frazier & Schauben, 1994). However, if life events that the individual experiencing them assesses as negative are separated out from life events generally, i.e., death of significant others, job loss, and so on, this relationship becomes somewhat stronger, e.g., about $r = .25$ to $r = .45$ (Cohen et al., 1983; Frazier & Schauben, 1994; B. Lakey & Heller, 1985; Mueller, Edwards, & Yarvis, 1977; Pengilly & Dowd, 2000; Sarason, Johnson, & Siegel, 1978; Siegel & Brown, 1988), indicating that subjective assessment of an event as

positive or negative may be a moderating factor. Nonetheless, while the relationship between negative life event stress and distress is consistent across the research literature, it accounts for no more than approximately 20% of the variability between the two (B. Lakey & Heller, 1985; Sarason et al., 1978) and researchers have therefore endeavored to identify other moderators (Rabkin & Struening, 1976).

Mindfulness and Meditation

Responses to life events can be automatic (Bargh, 1997). Such automatic responses can include emotional reactivity and rapid, heuristic assessment of the impact of an event on oneself and one's situation (Bargh & Chartrand, 1999), which can lead to outcomes that increase distress, such as negative emotion or negative judgment of oneself. Processes that affect automaticity could, therefore, affect the stress-distress relationship; one such potential process is mindfulness. Mindfulness can generally be described as attending to one's moment-to-moment internal and external experiences in a non-judgmental manner (Baer, 2003; Brown & Ryan, 2003; Hanh, 1976; Kabat-Zinn, 1990). The construct draws primarily on Buddhism and Eastern religious practice (Grabovac, Lau, & Willet, 2011), although it relates to some Western concepts as well, such as phenomenology and existentialism (Brown, Ryan, & Creswell, 2007). Scientific research into mindfulness was largely spurred by work in the early 1980s on its use in treatment of chronic pain (Kabat-Zinn, 1982). It is currently the focus of a good deal of inquiry and discussion: a recent PsychINFO search of articles containing the keyword "mindfulness" produced 2,121 hits. Much of this work focuses on in its application to

psychotherapy and other clinical concerns; since the original application to treatment of chronic pain, mindfulness techniques have been tailored to address a range of clinical issues, such as borderline personality disorder (Linehan, 1993a, 1993b), chronic major depressive disorder (Segal, Williams, & Teasdale, 2002), generalized anxiety disorder (Evans et al., 2008; Roemer, Salters-Pedneault, & Orsillo, 2006), eating disorders (Kristeller & Hallett, 1999), and others (Baer, 2006). A good deal of research indicates that mindfulness training can reduce distress. This includes not only general distress symptoms such as anxiety, depressed mood, and digestive tract issues (Agee, Danoff-Burg, & Grant, 2009; Baer, 2003; Ostafin et al., 2006; Ree & Craigie, 2007), but subjective experience of chronic pain (Baer, 2003; Kabat-Zinn, 1982), sleep disturbance (Carlson & Garland, 2005), and rumination (Ramel, Goldin, Carmona, & McQuaid, 2004). It has also been shown to increase general relaxation (Jain et al., 2007).

Attempts to define and deconstruct mindfulness have led to a wide range of assessments (Baer, Smith, & Allen, 2004; Brown & Ryan, 2003; Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008; Chadwick et al., 2008; Erisman & Roemer, 2012; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007; Kamholz, Hayes, Carver, Gulliver, & Perlman, 2006; Lau et al., 2006; Walach, Buchheld, Buttenmuller, Kleinknecht, & Schmidt, 2006). Each of these assessments focuses on a particular aspect of mindfulness, such as awareness versus acceptance, trait-like mindfulness sustained over time versus assessing it in-the-moment, etc. One group of researchers attempted to integrate this multifurcation of research paths and to identify the underlying mechanisms

of mindfulness by collecting and factor analyzing all available mindfulness assessments (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). This project identified five factors that best represented the various perspectives on the construct of mindfulness at the time: the ability to notice, to perceive clearly oneself and one's environment, labeled the "observe" factor; the ability to express verbally one's experience, called the "describe" factor; the ability to suspend judgment, to refrain especially from automatic negative evaluation, labeled "nonjudge"; the ability to limit emotional reactivity, again, especially negative reactions, called "nonreact"; finally, the ability to operate intentionally, staying aware of one's actions even while engaged in automatized behaviors such as driving or showering, named acting with awareness or "actaware." While mindfulness can be broken down into these subscales, the sum of factor scores may also be used as a measure of overall mindfulness skills (Lykins & Baer, 2009).

Stress, Distress, Mindfulness, and Meditation

Along with the main effects of negative life events predicting increased distress and mindfulness predicting reduced distress, it is possible that mindfulness may moderate the distressing effects of negative life events. If distress is produced in part by automatic negative evaluations of and affective responses to stressful circumstances, the attenuation of these processes through improved mindfulness, and specifically the skills countering automaticity entailed in the facets of nonjudge and nonreact, should reduce the strength of the stressor-distress relationship in those with higher levels of mindfulness. Therefore, it is expected that

Hypothesis 1: The relationship between negative life events and distress should be weaker among participants with higher scores for overall mindfulness and the facets of nonjudge and nonreact, as compared to those with lower mindfulness scores.

Meditation

Mindfulness varies naturally across individuals (Brown & Ryan, 2003), but can also be developed through training. Although some mindfulness-based psychotherapeutic interventions, such as Dialectical Behavior Therapy (DBT; Linehan, 1993a, 1993b), specifically eschew formal meditation, for others, such as Mindfulness-based Stress Reduction (MBSR; Kabat-Zinn, 1982) and Mindfulness-based Cognitive Therapy (MBCT; Segal et al., 2002), it is a central component, and most at least include meditative practice (Baer, 2006). Mindful meditation is practiced widely in religious communities and health centers, and there is much anecdotal evidence of its attenuating effects on distress (Epstein, 1998; Goleman, 1971; Hanh, 1976; S. Suzuki, 1970). The practice typically involves sitting and attending to one's breath or thoughts, or to body postures, as in yoga. Generally, its aim is to explore the contents of one's awareness and to practice suspending judgment of those contents (Hanh, 1976; Reps & Senzaki, 1957).

Although mindfulness can be developed through formal meditation practices, not all meditation is expressly oriented toward mindfulness. Other types of meditation include concentrative, in which one practices directing one's attention to a particular object or act, and lovingkindness or metta meditation, which focuses on the development

of compassion (Dunn, Hartigan, & Mikulas, 1999; Pace et al., 2009; Valentine & Sweet, 1999). Meditation, regardless of type, is associated with lower levels of distress (Alexander, Langer, Newman, Chandler, & Davies, 1989; Andresen, 2000; Nielsen & Kaszniak, 2006) and this effect appears to increase with years of meditation experience (Verma & Araya, 2010). It may be that these various types of meditation have shared effects distinct from those imparted by mindfulness skills as such. For example, meditation is frequently learned in a group or community setting; it is possible that such settings foster development of social support networks and such networks have been associated with reduced distress (Pengilly & Dowd, 2000). It is also possible that simply regularly taking time to focus one's attention away from negative life events, entailed in any type of meditation practice, reduces the time spent thinking about those events and so provides relief from some of their distressing effects. In any case, those with more meditation experience and/or regular practice time would be expected to have a greater buffer against stressors than those with less meditation time or none. Thus, this study predicts that

Hypothesis 2: When experiencing high levels of negative life event stress, a meditator should suffer fewer distress symptoms than a non-meditator, while at low levels of stress, meditation should have less of an effect.

Mindfulness and Automaticity

Processing significant negative life events is intrinsically cognitively demanding and emotionally laden; these loads reduce the availability of resources for other activities,

such as coping behaviors (Baumeister, Bratslavsky, Muraven, & Tice, 1998). Conversely, activities that are automatic require fewer cognitive and affective resources and repeated practice of non-automatic activities increases their automaticity over time (Bargh & Chartrand, 1999; Baumeister et al., 1998). This means that, when developing mindfulness through formal meditation practice, deploying mindfulness skills under stress should be more difficult for novice or non-meditators, since those skills have not yet become automatic. On the other hand, individuals with lengthy mindful meditation practice would have had the opportunity for mindfulness skills to become automatic, i.e., to require less cognitive energy, and they should therefore more easily deploy these skills under stress. Therefore, one can expect

Hypothesis 3: Mindfulness will be reduced by high frequencies of negative life events, but this effect will be attenuated by longer meditation experience.

It is possible that mindfulness does not only moderate the stress-distress relationship, but may act as a mediator. If negative life events reduce mindfulness, mindfulness reduces distress, and stress increases distress, three of the four criteria for a mediational chain of relationships (Baron & Kenny, 1986) would be present. Specifically, a predictor (life event stress) would predict an outcome (distress), a candidate mediator (mindfulness) would predict the same outcome, and the predictor would also predict the mediator. Therefore, the current study will test for the fourth criterion, that mindfulness should account for a portion of the relationship between stress and distress. In summary

Hypothesis 4: Mindfulness overall will account for a portion of the relationship between negative life events and distress.

Mindfulness and Meditation

Baer and her colleagues (Baer et al., 2004; Baer et al., 2006), in their development of mindfulness assessments found that the observe facet behaved differently depending upon whether or not the population being assessed had formal meditation training. Meditators and non-meditators appeared to have different understandings of what it means to observe: for non-meditators, being observant includes automatic assessment of that which is being observed, while meditators seemed to have developed the ability to parse assessment from observation.

This being the case, as a consequence of the automaticity of their judgement, stressed highly observant non-meditators would appear to be likely to labor under a greater cognitive load than would stressed highly observant meditators. This added process reduces the resources available to individuals coping with stressors (Baumeister et al., 1998), increasing the likelihood that they will experience distress symptoms. It would therefore be expected that individuals under stress who score high on the observe facet of mindfulness would exhibit differences in their stress-distress relationship depending on their meditation status. Specifically, the stress-distress relationship should differ most between meditators and non-meditators among participants with high negative life event and high observe scores, with meditators having the weakest relationship and non-meditators having the strongest. Participants under stress who have

low observe scores, on the other hand, would be expected to show little difference in stress-distress relationships based on meditation status. Lastly, differences in stress-distress relationships should be relatively small or nonexistent among participants with low negative life event scores, regardless of observe scores or meditation status. To summarize, a three-way interaction of stress, meditation status, and the observe facet of mindfulness in predicting distress is expected. Specifically

Hypothesis 5: The interaction predicted in Hypothesis 2 (meditation reduces the stress-distress relationship) should be more evident among participants with high observe scores, compared to those with low observe scores.

Hypotheses

To summarize, the current study makes the following predictions:

1. The relationship between negative life events and distress should be weaker among participants with higher scores for overall mindfulness and the facets of nonjudge and nonreact, as compared to those with lower mindfulness scores.

2. When experiencing high levels of negative life event stress, a meditator should suffer fewer distress symptoms than a non-meditator, while at low levels of stress, meditation should have less of an effect.

3. Mindfulness will be reduced by high frequencies of negative life events, but this effect will be reduced by longer meditation experience.

4. Mindfulness will account for a portion of the relationship between negative life events and distress.

5. The interaction predicted in Hypothesis 2 should be more evident among participants with high observe scores, compared to those with low observe scores.

CHAPTER 2

METHOD

Participants

To test these hypotheses, two samples were drawn. Sample A (n = 100) was taken from mindful meditation communities across North America. Participants were recruited through flyers delivered to meditation centers focusing on mindful meditation, posts to mindfulness-associated listservs, and word of mouth. Entry into a lottery for $100 was offered for participation. Participants ranged in age from 19 to 73 with a mean age of about 42 (M = 41.81, SD = 13.11); 72% were female and 86% were of European descent, with 3% identifying as Hispanic, and the balance comprised of 3% of persons of African descent, 2% each of persons of Native American or Pacific Islander descent, 1% each of persons of Arabic, East Asian, or South Asian descent, and, finally, 5% of respondents identifying as Other. Over two-thirds of the participants (69%) responded with "yes" to the question, "Do you meditate?" That the rate of endorsement of this item was not near to 100% was unexpected, given that all participants were recruited through community meditation centers. There are at least two possible reasons for this. First, some participants may have interpreted the question to mean "Do you meditate *regularly*," rather than the intended "Do you meditate *at all*." Those who meditate but whose regularity of practice falls short of some self-imposed goal may not endorse the question

as phrased. Similarly, it is possible that novice meditators may not respond affirmatively if they have not been meditating long enough to meet their personal idea of what a meditation practice should look like. In any case, for the purposes of current analyses, only those participants who responded to this question with "yes" will be treated as meditators, regardless of which sample they belong to.

Sample B (n = 90) was taken from the student body of a mid-sized private university in the Mid-Atlantic region of the United States and those students' social networks. Participants were recruited directly through university flyers and listservs and, indirectly, through a snowball sample initiated from a university student's page in a social networking website; no attempt was made to limit recruitment based on whether or not individuals practiced mindful meditation. Eligible students were offered course credit for participation in an online survey; others received no compensation, but were asked to participate in support of a dissertation project. Participants ranged in age from 18 to 68 with a mean age of roughly 28 (M = 27.73, SD = 10.39); 76% were female and 79% were of European descent, with 7% identifying as Hispanic, 3% each of African or East Asian descent, 2% each of Native American, non-Arabic Middle Eastern, or South Asian descent, 1% Arabic descent and, finally, 9% of respondents identifying as Other. A small portion of participants (10%) reported meditating regularly; as above, those who replied "yes" to the meditation question will be grouped with meditators in the below analyses. See Tables 1-4 for details on both samples and their aggregate.

Table 1

Demographic Descriptive Statistics: Age Distribution

	Sample A	Sample B	Samples A & B
Range	19-73	18-68	18-73
Mean	41.8	27.7	35.1
SD	13.1	10.4	13.8

Table 2

Demographic Descriptive Statistics: Sex Distribution

	Sample A		Sample B		Samples A & B	
Sex	***n***	***%***	***n***	***%***	***n***	***%***
Female	72	72	68	76	140	74
Male	28	28	22	24	50	26

Table 3

Demographic Descriptive Statistics: Race/Ethnicity

	Sample A		Sample B		Samples A & B	
Descent	***n***	***%***	***n***	***%***	***n***	***%***
African	3	3	3	3	6	3
Arabic	1	1	1	1	2	1
East Asian	1	1	3	3	4	2
European	86	86	71	79	157	83
Native	2	2	2	2	4	2
Non-Arabic	0	0	2	2	2	1
Pacific Island	2	2	0	0	2	1
South Asian	1	1	2	3	3	2
Other	5	5	8	9	13	7
Hispanic	3	3	6	7	9	5

Note: Percents may not sum to 100 because participants could select more than one category.

Table 4

Demographic Descriptive Statistics: Religion

	Sample A		Sample B		Samples A & B	
Religion	***n***	***%***	***n***	***%***	***n***	***%***
Christian	22	22	43	48	65	34
Jewish	13	13	8	9	21	11
Muslim	0	0	0	0	0	0
Hindu	0	0	0	0	0	0
Sikh	1	1	0	0	1	1
Buddhist	31	31	4	4	35	18
Atheist/	15	15	32	36	47	25
Other	13	13	3	3	16	8
None	19	19	12	12	31	16

Note: Percents may not sum to 100 because participants could select more than one category.

Materials

Assessments

Life events were measured using the Life Events Survey (LES; Sarason et al., 1978), a 70-item self-report inventory of significant life events. Items were derived from previous, established life event inventories, such as Holmes & Rahe (1967), and updated to be more specific, e.g., an item referring simply to a pregnancy was broken into two items specifying the effect of the pregnancy on oneself versus one's partner. Other example items are "detention in jail or comparable institution," "death of a spouse," and "major change in sleeping habits (much more or much less sleep)." Participants endorse items that have occurred in their lives during the last six months and then rate the valence

of those items on a seven-point scale, with -3 being the most negative, +3 the most positive, and 0 being neutral. Scores are calculated by summing ratings for all endorsed negative and positive items separately, e.g., three events rated by a participant as -1, -2, and -3 would produce a score of 6 on the negative event scale. Although positive and negative event LES items are typically scored, only negatively valenced events will be included in the current analyses. The heterogeneity of the individual items renders inter-item reliability estimates meaningless; however, test-retest data during instrument development resulted in coefficients of $r \sim .65$ over the course of five to six weeks (Sarason et al., 1978). Additionally, the LES has been shown to correlate with depression, at $r = .24$, $p < .05$, and high scores have been associated with clinical versus non-clinical populations (Sarason et al., 1978).

Mindfulness was measured with the Five Factor Mindfulness Questionnaire (FFMQ; Baer et al., 2006), a 39-item self-report instrument consisting of five subscales corresponding to theoretical factors of mindfulness, as discussed above: observe, describe, nonjudge, nonreact, and actaware. Items include, for example, "When I'm walking, I deliberately notice the sensations of my body moving" (observe), "I'm good at finding words to describe my feelings" (describe), "I criticize myself for having irrational or inappropriate emotions" (nonjudge, reverse coding), "I perceive my feelings and emotions without having to react to them" (nonreact), and "When I do things, my mind wanders off and I'm easily distracted" (actaware, reverse coding). Participants rate the degree to which each item is true on a five-point scale, with 1 being "never or rarely true"

and 5 being “very often or always true,” with some items being reverse coded. Individuals' scores are calculated by correcting reverse coded items and then finding the mean of all items for each subscale; an overall mean may also be calculated. For example, three reverse score corrected items rated as 1, 3, and 5 would result in a score of 3. In regression analyses, three of the five facets have significantly negatively predicted distress symptoms: nonjudge, at β = -0.36, nonreact, at β = -0.11, and actaware, at β = -0.29 (Baer et al., 2006). Cronbach’s alpha coefficient for overall mindfulness in the current combined sample was α = .97. The facets’ alpha coefficients were: observe α = .94, describe α = .96, nonjudge α = .96, nonreact α = .94, and actaware α = .94.

The Brief Symptoms Inventory (BSI; Derogatis & Melisaratos, 1983), a self-report instrument, was used to measure participants’ distress. The BSI is a 53 item inventory of symptom patterns of psychological distress, such as undesirable thoughts or problems concentrating, and physical sensations like nausea, tingling, or insomnia. Each item is rated for severity on a 5-point scale ranging from 0 "not at all" to 4 "extremely." The BSI can be scored using a global scale and/or nine subscales. Individual scores are calculated by summing responses; for example, three items rated by a participant as 0, 2, and 4 would result in a score of 6. The BSI is a commonly applied instrument for studying distress; in particular, it was used in the convergent validity analysis of the FFMQ (Baer et al., 2006), in which the nonjudge, nonreact, and actaware facets negatively predicted BSI scores. Test-retest stability coefficients range from r = .68 to r = .91 for the subscales and r = .90 for the global scale (n = 60), and factor analyses have been

acceptably consistent with the authors' multifactorial structure (Derogatis & Melisaratos, 1983). However, there is also research suggesting that the BSI is actually a single-factor distress scale (Boulet & Boss, 1991). Initial analyses in the current study were more consistent with this latter interpretation; therefore, the BSI global scale was used exclusively here. Cronbach's alpha coefficient for the current study's global scale was $\alpha = .958$.

Meditation and demographic data were collected as well. Participants were asked to indicate their age, sex, race, ethnicity, and religion. Those responding with "yes" to the question, "Do you meditate?" were asked to estimate hours per week that they meditate, and for how long, in months and years, they have practiced. As Sample A was taken from mindful meditation communities, "meditation" was not defined; for the purposes of comparison, the term was also left undefined for participants from Sample B. See Appendix for details.

Procedures

Recruited participants were directed to a website that provided basic information and served as a portal to the questionnaires. They were asked to read and approve the informed consent form, after which they were directed to the surveys, which were administered confidentially via SurveyMonkey.com, an online questionnaire-based data collection service. Participants were asked to respond to the above assessment instruments, questions regarding their meditation practice, if any, and demographic items. Once they had completed the survey, Sample A participants were asked to provide their

name and contact information if they wished to be included in the lottery; these data were kept separately from all other data. Sample B participants who wished to receive course credit for their responses were directed to a separate form located on the university's psychology department website; data from these two websites were not shared, in order to retain participants' anonymity. Once all Sample A data were collected, a lottery winner was selected at random and the prize delivered to the winner.

CHAPTER 3

RESULTS

Data Preparation and Sample Characteristics

Samples A and B were collected with the intention of combining them to increase statistical power with increased variability and sample size. Along with basic descriptive analyses, the samples were analyzed for potential confounds.

Data from nine (Sample A $n = 5$, Sample B $n = 4$) participants who did not respond to at least two of the three primary instruments, LES, FFMQ, or BSI, were excluded. Because the distributions were highly skewed for the LES, BSI, meditation hours per week, and total years, these distributions were normalized using square root transformation. This risks inflation of results; however, given the necessity of normally distributed data for analyses, transformation was required to proceed. Skewness for these variables was similar for both samples and is not separately reported for each sample (see Table 5). Tables 5 through 7 below show descriptive data and intercorrelations.

Table 5

Descriptive Statistics for Study Measures: All Participants

Measure	*n*	*Mean*	*SD*	*Minimum*	*Maximum*	*Skewness*	*SE Skew*
Meditation (yes/no)	80	0.42	0.50	0	1	0.32	0.18
Meditation (hours/wk)	80	3.45	2.65	1	14	1.78	0.27
Meditation (hours/wk)†	80	1.75	0.63	0.87	3.74	0.97	0.27
Meditation (years)	79	5.32	6.23	0	30	2.06	0.27
Meditation (years)†	79	1.98	1.19	0.28	5.48	0.90	0.27
LES	184	7.85	8.58	0	52	1.99	0.18
LES†	184	2.36	1.52	0	7.21	0.37	0.18
FFMQ overall	188	3.49	0.56	1.87	4.64	-0.31	0.18
FFMQ observe	188	3.44	0.80	1	5	-0.53	0.18
FFMQ describe	188	3.73	0.78	1.13	5	-0.49	0.18
FFMQ nonjudge	188	3.78	0.86	1.38	5	-0.59	0.18
FFMQ nonreact	188	3.18	0.72	1	5	-0.18	0.18
FFMQ actaware	188	3.28	0.71	1.5	5	-0.3	0.18
BSI	185	31.56	26.23	0	121	1.42	0.18
BSI†	185	5.16	2.23	0	11	0.48	0.18

Note: Descriptive statistics do not include participants who did not respond to items for the variable in question. "†" denotes square root transformed variables.

Table 6

Descriptive Statistics for Study Measures: Samples A & B

	n		***Mean***		***SD***		***Minimum***		***Maximum***	
Measure	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
Meditation (yes/no)	69	11	0.69	0.12	0.47	0.33	0	0	1	1
Meditation (hours/wk)†	68	12	1.78	1.57	0.63	0.64	0.87	1	3.74	3.16
Meditation (years)†	69	10	2.01	1.81	1.23	0.90	0.28	0.41	5.48	3.87
LES†	94	90	2.19	2.53	1.43	1.59	0	0	5.66	7.21
FFMQ overall	100	88	3.64	3.32	0.52	0.56	1.87	1.90	4.64	4.44
FFMQ observe	100	88	3.78	3.06	0.61	0.82	1	1.25	5	4.75
FFMQ describe	100	88	3.90	3.53	0.71	0.82	1.75	1.13	5	5
FFMQ nonjudge	100	88	3.81	3.75	0.87	0.86	1.38	1.5	5	5
FFMQ nonreact	100	88	3.35	2.99	0.63	0.77	1	1.14	5	5
FFMQ actaware	100	88	3.31	3.24	0.75	0.67	1.5	1.75	5	4.88
BSI†	95	90	4.97	5.35	2.14	2.32	0	1.41	11	10.9

Note: Descriptive statistics do not include participants who did not respond to items for the variable in question. "†" denotes square root transformed variables.

Table 7

Intercorrelations of Study Measures and Subscales

Measure	FFMQ overall	FFMQ observe	FFMQ describe	FFMQ nonjudge	FFMQ nonreact	FFMQ actaware	BSI†
LES†	-0.30***	-0.06	-0.13	-0.32***	-0.28***	-0.32***	0.50***
FFMQ overall		0.70***	0.74***	0.72***	0.78**	0.69**	-0.58***
FFMQ observe			0.45***	0.26***	0.55***	0.25**	-0.21**
FFMQ describe				0.34***	0.51***	0.35***	-0.32***
FFMQ nonjudge					0.41**	0.50***	-0.63***
FFMQ nonreact						0.41***	-0.43***
FFMQ actaware							-0.49***

Note: "***" denotes $p < .001$; "**" denotes $p < .01$; "†" denotes square root transformed variables.

Sample A participants, composed of persons in mindful meditation communities, were more likely to say they meditate, $\chi^2(df = 1, n = 190) = 62.64$, $p < .001$, $\varphi = 0.57$ (69% of Sample A, 12% of Sample B), and were more mindful overall, $t(186) = 3.97$, $p < .001$, with Sample A M = 3.64, SD = 0.52, and Sample B M = 3.32, SD = 0.56. Sample A participants were also older, $t(185.13) = 8.24$, $p < .001$, with Sample A M = 41.81, SD = 13.11, and Sample B M = 27.73, SD = 10.39. There were also significant differences in religion, χ^2 ($df = 6$, $n = 186$) = 43.62, $p < .001$, $\varphi = 0.48$. Using Field's (2009) method of using standardized residuals for post hoc decomposition of contributors to the overall χ^2

test, Sample A participants were more likely to identify as Buddhist, $z = 2.9$, $p < .01$ (28% of sample), while participants in Sample B were more likely to identify as Christian, $z = 2.4$, $p < .05$ (43% of sample). All other differences were non-significant.

Relationships between demographic variables and variables of interest were tested among all participants together ($n = 190$). Mindfulness was higher, $F(5, 177) = 4.22$, $p = .001$, among those identifying as Buddhist (M = 3.71, SD = 0.52) and Jewish (M = 3.79, SD = 0.47) relative to those identifying as Christian (M = 3.31, SD = 0.63). Some religious affiliations were related to meditation status as well, χ^2 ($df = 6$, $n = 186$) = 55.36, $\varphi = 0.55$, $p < .001$. Those identifying as Buddhist or Jewish were found to be significantly more likely to meditate, $z = 3.8$, $p < .001$ (87% of Buddhists) and $z = 2.2$, $p < .05$ (77% of Jews), respectively. Conversely, those identifying as Christian or atheist were significantly less likely to meditate, $z = -2.4$, $p < .05$ (20% of Christians) and $z = -2.3$, $p < .05$ (20% of atheists), respectively. Meditators (M = 41.98, SD = 13.43) were significantly older than non-meditators (M = 30.17, SD = 11.85), $t(157.31) = 6.28$, $p < .001$ and age correlated with mindfulness, $r = .341$, $p < .001$.

Outliers and Treatment of Potentially Confounding Variables

For all below regressions, outlier analyses were conducted using studentized deleted residual, hat matrix, standardized *DFβ* and *DFFits*, and Cook's *d* tests. No inordinately influential outlying values were found.

Because age demonstrates a significant relationship to sample, mindfulness, and meditation status, it is a potential confounding variable. This was tested using

hierarchical multiple regression analysis, regressing FFMQ scores (overall and each facet), LES scores, age, and all possible interactions, onto BSI scores. Age did not predict BSI as a main effect; its introduction to the model did not reduce the slope of either FFMQ or LES scores; it did not interact significantly with LES or FFMQ at any level. An analogous analysis was conducted for hypotheses employing meditation (years and status) with the same result. From this, it can be safely assumed that age is not confounded with any parameters of interest.

Hypothesis 1

Hypothesis 1 examines the relationship between distress symptoms, negative life events, and mindfulness. Specifically, an interaction should exist such that the relationship between negative life events and distress should be weaker among participants with higher scores for overall mindfulness and the facets of nonjudge and nonreact, as compared to those with lower mindfulness scores.

This hypothesis was tested using multiple regression models to examine if BSI scores are predicted by LES scores, FFMQ scores, and their interaction. For the sake of completeness and comparison, models were constructed for each for the five facets and overall mindfulness. In this analysis and elsewhere unless noted, data were standardized for the purposes of producing standardized β values for ease of comparison across models; standardization of course required centering the data, which allowed them to meet criteria for decomposition of any interactions that may be revealed (Aiken & West, 1991). Variables were entered using a three-step hierarchical regression: in the first step,

negative life events alone predict distress symptoms; in the second, mindfulness and negative life events predict distress; in the third, mindfulness, negative life events, and their interaction are predictors.

1. $\hat{y} = \beta_0 + \beta_1 x$

2. $\hat{y} = \beta_0 + \beta_1 x + \beta_2 z$

3. $\hat{y} = \beta_0 + \beta_1 x + \beta_2 z + \beta_3 xz$

Where:

y = distress symptoms

x = negative life event stress

z = mindfulness

Step one produced a significant result of $F(1, 182) = 63.3$, $p < .001$, $r^2 = .26$, with negative life events significantly predicting distress symptoms, $\beta = 0.51$, $p < .001$. Table 8 summarizes the results of steps two and three.

Table 8.

Mindfulness Moderating the Effects of Negative Life Events on Distress Symptoms

Facet	β(LES†)	β(FFMQ)	β(int)	F	r^2_{adj}
overall	0.35***	-0.48***	-0.01	50.5***	0.45
observe	0.49***	-0.17**	-0.05	23.0***	0.27
describe	0.47***	-0.27***	0.01	28.1***	0.31
nonjudge	0.33***	-0.54***	0.09	65.1***	0.52
nonreact	0.41***	-0.31***	0.11	31.9***	0.34
actaware	0.38***	-0.38***	0.02	35.6***	0.36

Note: "β(LES)" and "β(FFMQ)" represents the value of the slope estimate for negative life events and mindfulness, respectively, in the main effects model; "β(int)" represents the value of the slope estimate for the interaction (product) of negative life events and mindfulness in full model; "F" is the F-statistic for the full model; "r^2_{adj}" indicates the adjusted effect size for the full model; "***" denotes $p < .001$; "**" denotes $p < .01$; "*" denotes $p < .05$; "†" denotes square root transformed variables.

As expected, in all models increased negative life events predicted increased distress symptoms, while greater mindfulness significantly predicted decreased distress. However, contrary to the hypothesis, no interaction terms were significant, although the interaction terms for nonjudge and nonreact were marginal, $p = .095$ and $p = .07$, respectively.

Hypothesis 2

Hypothesis 2 examines the relationship of negative life events, distress symptoms, and meditation. Specifically, it was hypothesized that, when experiencing high levels of negative life stress, a meditator should suffer less distress than a non-meditator, while at low levels of stress, meditation should have less of an effect.

As above, the model was tested hierarchically, in three steps: step one includes LES alone as an independent variable; step two, LES and meditation status together; step three, LES, meditation status, and their interaction. Step one was the same as above in Hypothesis 1, $F(1, 182) = 63.3$, $p < .001$, $r^2 = .26$, with negative life events significantly predicting distress symptoms, $\beta = 0.51$, $p < .001$. Step two was significant as expected, $F(2, 181) = 35.5$, $p < .001$, $r^2_{adj} = .27$; negative life events remained significant and meditation was significant, $\beta = -0.32$, $p = .02$. However, contrary to prediction, the

interaction term in step three was non-significant, $\beta = -0.25$, $p = .06$, although it was in the expected direction.

Hypothesis 3

Hypothesis 3 focuses on the effect of negative life events on mindfulness. Specifically, it was expected that mindfulness would be reduced by high frequencies of negative life events, but this effect should be attenuated by longer meditation experience.

As above in Hypothesis 1, stepwise hierarchical models for overall mindfulness and each facet were constructed for the sake of completeness and comparison. Contrary to expectations, while years meditating significantly predicted mindfulness, $\beta = 0.265$, $p = .008$, LES scores and the interaction term were non-significant; the model was significant as a whole, $F(3,70) = 2.83$, $p = .045$, $r^2_{adj} = .07$. Models based on facets of mindfulness indicated no significant main effects or interactions.

Because this model incorporated years meditating, its data were limited to active meditators ($n = 80$). To increase power with a larger sample, the regression was run again with meditation status (meditator versus non-meditator) in place of years meditating. As above, this yielded six hierarchical regressions; see Table 9 for a summary of results.

Table 9.

Meditation Status Moderating the Effects of Negative Life Events on Mindfulness among All Participants (n = 190)

Facet	β(LES†)	β(med)	β(int)	F	r^2_{adj}
overall	-0.22**	0.84***	0.25	21.8***	0.26
observe	0.03	0.87***	0.09	12.9***	0.17
describe	-0.07	0.53***	0.12	5.37***	0.07
nonjudge	-0.27***	0.50***	0.18	11.7***	0.15
nonreact	-0.21**	0.70***	0.27	15.4***	0.19
actaware	-0.27***	0.44**	0.29	11.6***	0.15

Note: "β(LES)" and "β(med)" represent the value of the slope estimate for negative life events and meditation status, respectively, in main effects only model; "β(int)" represents the value of the slope estimate for the interaction (product) of negative life events and meditation status in full model; "F" is the F-statistic for the full model; "r^2_{adj}" indicates the adjusted effect size for the full model; "***" denotes $p < .001$; "**" denotes $p < .01$; "*" denotes $p < .05$; "†" denotes square root transformed variables.

As expected, FFMQ scores for overall mindfulness were significantly negatively predicted by LES and positively predicted by meditation status. Meditation status also positively predicted each facet of mindfulness; LES negatively predicted mindfulness in every model except the observe and describe facets. No interaction terms were significant, although those in the nonreact and actaware models were marginal, $p = .06$ and $p = .05$, respectively.

Hypothesis 4

Hypothesis 4 looks for evidence that mindfulness may potentially mediate an indirect effect of negative life events on distress as per Baron and Kenny (1986). This model is comprised of four separate regressions testing 1) life events negatively predicting mindfulness, 2) mindfulness negatively predicting distress, 3) life events positively predicting distress, and 4) life events predicting distress when mindfulness is controlled for. For mediation to be said to occur, all four regressions must be significant and the β value of negative life events in 4) must be smaller than that in 3); this would indicate that the presence of mindfulness accounts for some portion of the effect of negative life events on distress. Thus:

1. $\hat{z} = \beta_0 + \beta_1 x$

2. $\hat{y} = \beta_2 + \beta_3 z$

3. $\hat{y} = \beta_4 + \beta_5 x$

4. $\hat{y} = \beta_6 + \beta_7 x + \beta_8 z$

5. $\beta_7 < \beta_5$

Where:

y = distress symptoms

x = negative life event stress

z = mindfulness

In addition, Sobel tests for significant indirect relationships (Sobel, 1982) were conducted. Table 10 summarizes the results for mindfulness overall; Table 11 summarizes those for mindfulness facets.

Table 10.

Overall Mindfulness as Potential Mediators of Negative Life Events and Distress

Regression	β_1	β_2	F	r^2_{adj}	t
1) FFMQ on LES†	-0.31***	(na)	18.1***	0.09	
2) BSI† on FFMQ	-0.58***	(na)	94.6***	0.34	
3) BSI† on LES†	0.51***	(na)	63.3***	0.25	
4) BSI† on LES† + FFMQ	0.35***	-0.48***	76.1***	0.45	
Sobel test					3.9***

Note: "β_1" represents the value of the slope estimate for the predictor variable in each regression; "β_2" represents the value of the slope estimate for the potential mediator variable in the fourth regression; "(na)" indicates that there was no β_2 value for that regression; "F" is the F-statistic for each regression; "r^2_{adj}" indicates the adjusted effect size for each regression; "t" denotes the t-statistic for the model's Sobel test; "***" denotes $p < .001$; "**" denotes $p < .01$; "*" denotes $p < .05$; "†" denotes square root transformed variables.

Results indicate that, as predicted, overall mindfulness is a potential mediator of the relationship between life event stress and distress symptoms. In addition, the facets of nonjudge, nonreact, and actaware appear to mediate stress and distress: in each of these models, all regressions were significant and the β value for life events in regression 3) was higher than regression 4) and Sobel (1982) tests were significant.

Table 11.

Mindfulness Facets as Potential Mediators of Negative Life Events and Distress

Regression	β_1	β_2	F	r^2_{adj}	t (Sobel)
Observe					
1) FFMQo on LES†	-0.06	(na)	0.67	0.003	
2) BSI† on FFMQo	-0.20**	(na)	7.5**	0.03	
3) BSI† on LES†	0.51***	(na)	63.3***	0.25	
4) BSI† on LES† + FFMQo	0.49***	-0.17**	34.2***	0.27	0.78
Describe					
1) FFMQd on LES†	-0.13	(na)	2.95	0.01	
2) BSI† on FFMQd	-0.32***	(na)	21.6***	0.10	
3) BSI† on LES†	0.51***	(na)	63.3***	0.25	
4) BSI† on LES† + FFMQd	0.47***	-0.27***	42.3***	0.31	1.61
Nonjudge					
1) FFMQj on LES†	-0.32***	(na)	19.9***	0.09	
2) BSI† on FFMQj	-0.64***	(na)	133***	0.42	
3) BSI† on LES†	0.51***	(na)	63.3***	0.25	
4) BSI† on LES† + FFMQj	0.33***	-0.54***	95.2***	0.51	4.16***
Nonreact					
1) FFMQr on LES†	-0.29***	(na)	15.3***	0.07	
2) BSI† on FFMQr	-0.42***	(na)	40.0***	0.18	
3) BSI† on LES†	0.51***	(na)	63.3***	0.25	
4) BSI† on LES† + FFMQr	0.41***	-0.31***	45.6***	0.33	3.32***
Actaware					
1) FFMQa on LES†	-0.32***	(na)	20.3***	0.10	
2) BSI† on FFMQa	-0.49***	(na)	56.6***	0.23	
3) BSI† on LES†	0.51***	(na)	63.3***	0.25	
4) BSI† on LES† + FFMQa	0.38***	-0.38***	53.6***	0.37	3.86***

Note: "β_1" represents the value of the slope estimate for the predictor variable in each regression; "β_2" represents the value of the slope estimate for the potential mediator variable in the fourth regression; "(na)" indicates that there was no β_2 value for that regression; "F" is the F-statistic for each regression; "r^2_{adj}" indicates the adjusted effect size for each regression; "t" denotes the t-statistic for the model's Sobel test; "***" denotes $p < .001$; "**" denotes $p < .01$; "*" denotes $p < .05$; "†" denotes square root transformed variables.

Hypothesis 5

Hypothesis 5 tested a three-way interaction between negative life events, meditation status, and the observe facet of mindfulness. Specifically, it was expected that the interaction predicted in Hypothesis 2, that meditators are better protected against life event stress than non-meditators, would be most evident among participants scoring high in observe.

This hypothesis was tested using a three-step hierarchical regression: step one consisted of all main effect variables, LES, observe, and meditation status; step two consisted of main effect variables plus all two-way interactions, LES by observe, LES by meditation status, and observe by meditation status; step three consisted of all previous variables plus the three-way interaction, LES by observe by meditation status. Thus:

1. $\hat{y} = \beta_0 + \beta_1 x + \beta_2 z + \beta_3 w$

2. $\hat{y} = \beta_0 + \beta_1 x + \beta_2 z + \beta_3 w + \beta_4 xz + \beta_5 xw + \beta_6 zw$

3. $\hat{y} = \beta_0 + \beta_1 x + \beta_2 z + \beta_3 w + \beta_4 xz + \beta_5 xw + \beta_6 zw + \beta_7 xzw$

Where:

y = distress symptoms

x = negative life event stress

z = mindfulness

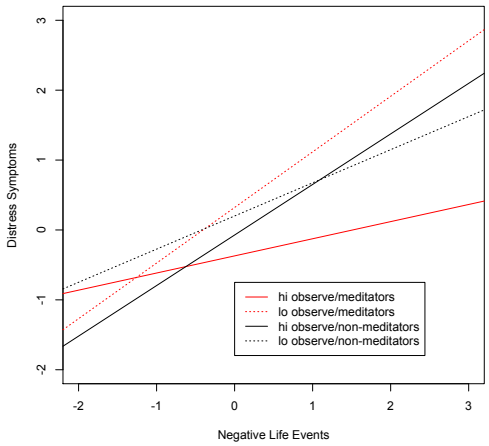
w = meditation status

Negative life events and, as expected, the three-way interaction were found to significantly predict distress, $\beta_1 x = 0.47$, $\beta_7 xzw = -0.40$, $F(3,70) = 2.83$, $p < .001$, $r^2_{adj} = .30$. All other main effects and interactions in this model were non-significant.

Interaction analyses

The three-way interaction was decomposed to determine if the data behaved in a manner consistent with predictions. Aiken and West's (1991) method was used; this approach shifts variables into high and low distributions by subtracting or adding, respectively, one standard deviation to centered scores. To decompose a three-way interaction in a three-predictor model, two predictors are held at constant high and low values, allowing the differential behavior of the remaining predictor on the dependent variable to be compared at the high and low values of each of the first two predictors. In the case of dichotomous variables like meditation status, dummy codes are used; here, non-meditators were coded as zero and meditators as one. Continuous variables, in this case the observe facet of mindfulness, are recalculated at one standard deviation above and below the mean of scores. When predicted values of distress are generated from actual values of negative life events based on estimated β values from the model above separately for high and low values of observe, and for meditators versus non-meditators, the following graph can be plotted (Figure 1).

Figure 1.



Distress Symptoms on Negative Life Events by Levels of Observe Facet and Meditation Status

Note: Lines represent predicted values based on slope estimations from the "observe" regression model in Hypothesis 5 using observe facet scores and meditation status. Graph scale increments represent standard deviations and roughly reflect the range and skewness of the distributions.

As predicted, the effect of negative life events on distress was weakest among meditators who scored high in the observe facet of mindfulness, $\beta = 0.25$, $p = .03$, as compared to $\beta = 0.80$, $p < .001$ for low-observe meditators, $\beta = 0.72$, $p < .001$ for high-observe non-meditators, and $\beta = 0.47$, $p < .001$ for low-observe non-meditators. Although all slopes differ significantly from zero, the stress-distress relationships among high-observe non-meditators, low-observe meditators, and low-observe non-meditators were not significantly different from each other, and only the slope of high observe meditators differed reliably from the others, $p = .02$.

Exploratory Analyses: Overall Mindfulness and Remaining Facets

As above, for completeness and comparison, three-way interaction analyses were repeated for mindfulness overall and each remaining facet of mindfulness. Results are summarized below in Table 12.

Table 12.

Distress Symptoms as Predicted by Negative Life Events, Mindfulness Overall and by Facet, Meditation Status, and Their Interactions among All Participants (n = 190; all variables and values standardized)

Facet	*β*(LES†)	*β*(FFMQ)	*β*(med)	*β*(LES† *FFMQ)	*β*(LES† *med)	*β*(FFMQ *med)	*β*(LES† *FFMQ *med)	*F*	r^2_{adj}
overall	0.36***	-0.50***	0.10	0.02	-0.13	0.07	-0.21	22.3***	0.45
describe	0.45***	-0.25***	-0.19	0.07	-0.26	0.13	-0.29	13.9***	0.33
nonjudge	0.32***	-0.54***	-0.05	0.11*	-0.28*	-0.19	-0.04	29.4***	0.52
nonreact	0.41***	-0.29***	-0.12	-0.07	-0.09	0.12	-0.18	14.1***	0.34
actaware	0.47***	-0.36***	-0.17	0.06	-0.17	0.13	0.002	16.0***	0.37

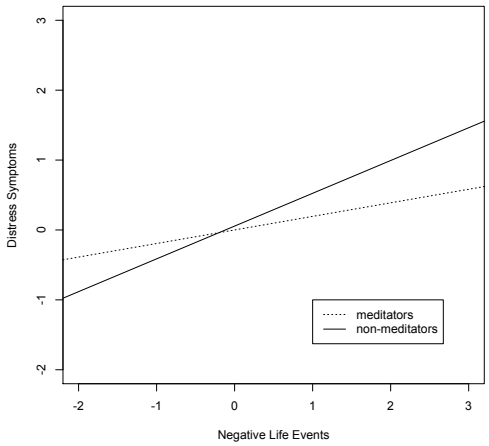
Note: "*β*(LES†)," "*β*(FFMQ)," and "*β*(med)" represent the value of the slope estimate for negative life events, mindfulness, and meditation status, respectively, for main effects models; "*β*(LES*FFMQ)," "*β*(LES*med)," and "*β*(FFMQ*med)" represent the value of the slope estimate for the interaction (product) of negative life events and mindfulness, of negative life events and meditation status, and of mindfulness and meditation status, respectively, for two-way interaction models; "*β*(LES*FFMQ*med)" represents the value of the slope estimate for the interaction (product) of negative life events, mindfulness, and meditation status for the full model; "*F*" is the *F*-statistic for the full model; "r^2_{adj}" indicates the adjusted effect size for the full model; "***" denotes $p < .001$; "**" denotes $p < .01$; "*" denotes $p < .05$; "†" denotes square root transformed variables.

Two two-way interaction terms in the nonjudge facet model, LES by nonjudge and LES by meditation status, were significant. No other interactions were significant, although that for LES by meditation status in the describe facet was marginal, $p = .06$. Significant main effects were seen in negative life events as well as mindfulness overall and all remaining facets. No significant main effect was found for meditation status.

The two-way interaction of negative life events by meditation status was decomposed. When a similar relationship was tested above in Hypothesis 2, the interaction of negative life events and meditation status was nonsignificant ($\beta = -0.25$, $p = .06$), but with the addition here of the nonjudge facet to the model, life events and meditation interact significantly ($\beta = -0.28$, $p = .021$). Normally, a non-significant result in a simpler two-way model might point to the significance in a three-way model being artifactual, or at least difficult to interpret meaningfully. However, because the result in Hypothesis 2 was marginal, a cautious further analysis at this level is warranted.

To decompose a two-way interaction within a three-way model, the variable not of interest, in this case nonjudge, is held at its mean, which, because the data are centered, is zero, while the predictor of interest, here meditation status, is shifted to high and low values, or meditators and non-meditators (Aiken & West, 1991). When predicted values of distress are generated from actual values of negative life events based on the β values from the meditation/nonjudge interaction above in Table 12 separately for those high and low in mindful nonjudgment, the following graph may be plotted (Figure 2).

Figure 2.



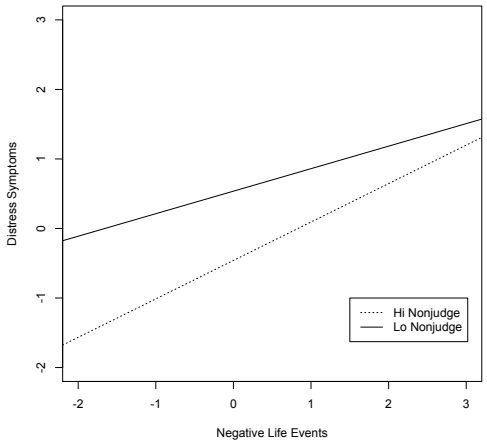
Distress Symptoms on Negative Life Events by Meditation Status at the Mean of Nonjudge

Note: Lines represent predicted values based on slope estimations from the "nonjudge" regression model in Table 12 using meditation status. Graph scale increments represent standard deviations and roughly reflect the range and skewness of the distributions.

Figure 2 indicates that, as frequency and significance of negative life events increased, meditators reported a weaker relationship with distress symptoms, or a shallower slope, $\beta = 0.32$, $p = .002$, compared to non-meditators, $\beta = 0.57$, $p < .001$.

There was also a two-way interaction of the nonjudge facet with life events. This relationship was decomposed as above, with meditation status held at its mean, while the nonjudge facet of mindfulness was set at values one standard deviation above and below the mean of scores. Figure 3 illustrates this relationship.

Figure 3.



Distress Symptoms on Negative Life Events by Mindful Nonjudgment at the Mean of Meditation Status

Note: Lines represent predicted values based on slope estimations from the "nonjudge" regression model in Table 12 using nonjudge scores. Graph scale increments represent standard deviations and roughly reflect the range and skewness of the distributions.

Figure 3 indicates that participants scoring high on the nonjudge facet of mindfulness showed a stronger relationship between negative life events and distress symptoms, $\beta = 0.43$, $p < .001$, than those with lower nonjudge scores, $\beta = 0.26$, $p < .001$.

CHAPTER 4

DISCUSSION

The purpose of this study has been to examine the interrelationships of mindfulness, meditation, negative life events, and distress symptoms, specifically whether and how mindfulness and meditation affect the relationship between life event stress and distress.

Hypothesis 1 tested if and how negative life events and mindfulness interact to affect distress symptoms. Mindfulness overall and the facets of nonjudge and nonreact were expected to behave as moderators such that higher or lower mindfulness would determine the strength of the relationship between negative life events and distress. Results indicated that this was not the case: higher overall mindfulness and all facets were associated with lower distress, and increases in negative life events were associated with higher distress, but there were no interactions.

Hypothesis 2 examined meditation as a potential moderator of negative life events and distress symptoms. The expected main effects were found; distress increased with life events and was negatively related to meditation status. However, there were no interactions.

Hypothesis 3 predicted that overall mindfulness would be negatively affected by increased negative life events, but that this effect would be moderated by meditation

experience. While years meditating predicted mindfulness overall, contrary to expectations, life events were not significantly related to mindfulness when controlling for years meditating and there was no interaction. Meditation status, that is whether or not participants identified as meditators regardless of duration of experience, was substituted for years meditating; this was positively related to mindfulness, and life event stress was negatively related to mindfulness overall, but no interactions were found. Additionally, all facets were significantly and positively related to meditation status, and negative life events were significantly and negatively related to the facets of nonjudge, nonreact, and actaware. However, there were no interactions.

Hypothesis 4 predicted that mindfulness overall would behave as a mediator as per Baron & Kenny's (1986) model and results indicated that this was the case. Specifically, negative life events, mindfulness, and distress were all significantly related, and mindfulness was shown to account for a portion of the stress-distress relationship. In addition, the facets of nonjudge, nonreact, and actaware also met criteria as potential mediators.

Hypothesis 5 re-examined Hypothesis 2 in the context of the observe facet of mindfulness. Specifically, the interaction predicted in Hypothesis 2, that meditation would reduce the stress-distress relationship, should be more evident among participants with high observe scores, relative to those with low observe scores. It was anticipated that meditation status would have the strongest effect on the stress-distress relationship among those with high negative life event scores and high observe scores, with

meditators having the weakest stress-distress relationship and non-meditators having the strongest. Meditation status was expected to make relatively little difference in the stress-distress relationship among those with high life event stress and low observe scores. As predicted, the stress-distress relationship among meditators with high observe scores was significantly weaker than that of other observe/meditation status combinations.

Some other results are worth noting. As part of an exploratory analysis, the three-way interaction model for Hypothesis 5 was used as a template to search for other interactions by substituting mindfulness overall and the four remaining facets in the place of the observe term. Although no other three-way interactions were found, two two-way interactions occurred in the nonjudge model. First, meditation status affected the stress-distress relationship, with meditators appearing less distressed by negative life events than non-meditators. This contrasted with Hypothesis 2, for which the interaction term was non-significant; this model, however, controls for the nonjudge facet of mindfulness. Second, nonjudge scores appeared to moderate participants' response to stress: those with relatively low nonjudge scores showed a weaker stress-distress relationship than those with higher nonjudge scores. This result is counter to what was found in Hypothesis 1, in which there was no interaction, but in this case meditation status was controlled for. That these interactions were not seen in Hypotheses 1 and 2 may be due to canceling each other out: meditators, who are higher in nonjudge, show a weaker stress-distress relationship, while high nonjudge participants, who are more likely to be

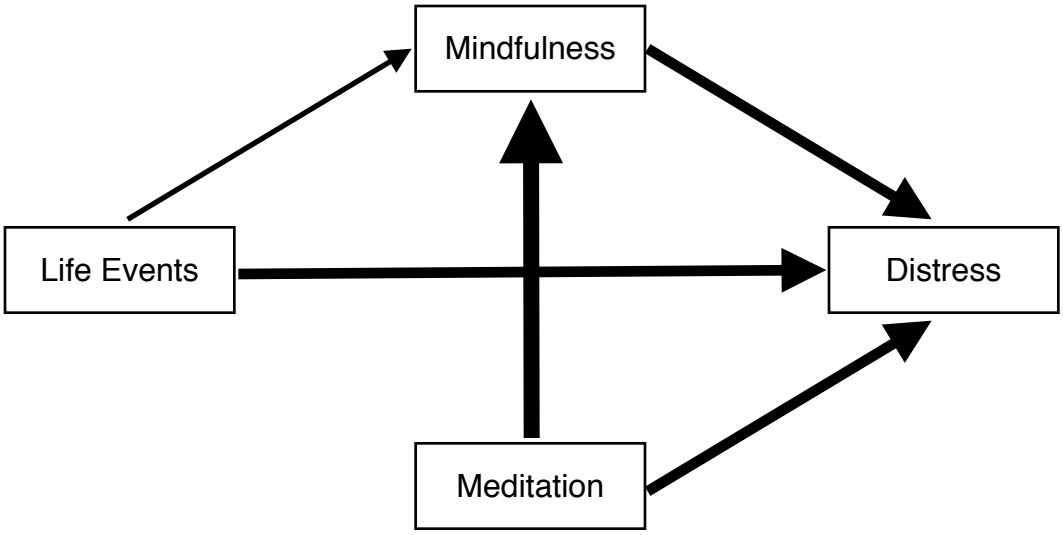
meditators, have a stronger relationship of stress to distress. This apparent contradiction will be discussed further below.

The non-significant results are worth considering in more detail. A few interactions were marginal: negative life events by nonjudge and negative life events by nonreact predicting distress (Hypothesis 1), negative life events by meditation status predicting nonreact and actaware (Hypothesis 3), and negative life events by meditation status in the describe facet predicting distress (exploratory analysis). The marginal p-values of these parameters might be taken as the result of a sample size too small to detect their relatively shallower slopes. However, a more important consideration might be those outcomes that are clearly non-significant. Meditation status showed no indication of interacting with negative life events in predicting distress. Negative life events did not significantly relate to the observe and describe facets of mindfulness. Beyond the above marginal results, negative life events did not interact with meditation status or experience to predict any facet of mindfulness or mindfulness overall. These outcomes may indicate that a) meditation and negative life events appear to be unrelated to each other, and b) the relationship between meditation and mindfulness seems not to be affected by life stresses.

To summarize, main effects are consistent throughout these analyses: negative life event stress is positively and moderately to strongly related to distress; life event stress is negatively and weakly related to mindfulness; mindfulness is negatively and moderately to strongly related to distress; meditation status is negatively and moderately related to

distress; meditation status and mindfulness are strongly and positively related. Figure 4 visualizes these relationships.

Figure 4.



Interrelationships of Main Effects

Note: Line thickness represents relative strength of relationship. Direction of arrows indicates direction of regression and is not meant to imply causality.

The paucity of clear interactions in the current research strengthens the established understanding of these constructs as acting on each other primarily independently. While the current analyses indicate no consistent moderational relationship, mindfulness overall and the facets of nonjudge, nonreact, and actaware do appear to have a mediational relationship with negative life events and distress symptsoms; through an indirect effect, these account for a small portion of the relationship between stress and distress.

Of the facets, nonjudge, nonreact, and actware had significant relationships with negative life events and distress symptoms in Hypotheses 1, 3, and 4. Nonjudge had the largest effects in Hypotheses 1 and 4, and was the only facet in which two-way interactions occurred. Although none were significant in more parsimonious models, the two-way interactions within the three-way model may be cautiously interpreted. The interaction of negative life events and meditation status when mindful nonjudgment is accounted for indicates that meditators may be less distressed by life event stress than non-meditators. This implies that meditation may, in fact, act independently of mindfulness, specifically the nonjudge facet, in affecting distress. It might be speculated, as suggested above, that social support or simply taking "down time" might be factors here. Conversely, when meditation status was controlled for, the nonjudge facet interacted with negative life events, producing a weaker stress-distress relationship among low nonjudge scorers than high scorers. In other words, persons who were *less* automatically judgmental seemed, surprisingly, to be *more* affected by negative life events as events increased in frequency and severity. Thus, it would appear that meditation and mindful nonjudgment produce opposite effects. However, distress levels for low nonjudge scorers were consistently higher than distress among high nonjudge scorers: high nonjudge participants had relatively low distress levels unless stress levels were high. This effect is consistent with the evidence from Hypothesis 3 that life event stress can interfere with mindfulness, in particular the nonjudge facet; these outcomes suggest that mindful nonjudgment may provide more of a buffer against distress at low

stress levels than high. Since the effects of meditation and mindful nonjudgment are in opposite directions, they may cancel each other out, making identifying their interaction with negative life events difficult without controlling for one or the other. Nonetheless, they operate concurrently and appear to have mutually supportive effects: mindful nonjudgment seems to reduce distress more effectively at low levels of stress than at high, while meditation weakens the stress-distress relationship.

The three-way interaction of negative life events, the observe facet of mindfulness, and meditation status in predicting distress indicates that meditation may be central to practitioners' understanding of aspects of mindful practice, specifically, what it means to observe oneself and one's surroundings: meditators with high observe scores showed significant differences in their stress-to-distress relationship relative to non-meditators or low-observe participants. The argument that Baer and her colleagues (2006) put forth is thus supported here: that formal mindfulness training, such as meditation, teaches one to observe oneself and one's environment with less automatic judgment.

The current results support four conclusions:

1. The consistency of the main effects and the strength of the mediational model indicate that mindfulness may be usefully conceptualized as a mediator of negative life events and distress symptoms. The support for this conceptualization does not rule out the possibility that mindfulness may moderate between stress and distress, although the current data provide no support for this relationship.

2. Meditation appears to have an attenuating effect on the stress-distress relationship independent of mindfulness.

3. Of the facets, mindful nonjudgment, nonreactivity, and acting with awareness appears to have the most consistent and strongest relationships with stress and distress, including being interfered with by negative life events.

4. Mindful nonjudgment appears to reduce distress at low stress levels more than it attenuates distress at high levels stress. It also appears to be the key factor in distinguishing between mindful and non-mindful observation.

Mechanisms of mindfulness

The above relationships among stress, distress, and the mindfulness facets of nonjudge, nonreact, and actaware suggest that interrupting automaticity may be one of the critical mechanisms through which mindfulness acts to reduce distress. A mindful individual is richly aware of her surroundings, body, thoughts, feelings, and actions (Hanh, 1976), whereas automatic behavior requires no such awareness (Bargh, 1994) and efforts to increase mindfulness appear to reduce automaticity (Chambers, Lo, & Allen, 2008; C. E. Lakey, Campbell, Brown, & Goodie, 2007; Ostafin & Marlatt, 2008; Wenk-Sormaz, 2005). Mindfulness is associated with increased acceptance and reduced emotional reactivity (Arch & Craske, 2006; Broderick, 2005; Brown et al., 2007; Ortner, Kilner, & Zelazo, 2007) and mindful practices in general strive to expand the breadth of awareness and acceptance of what is observed and, in so doing, create a "pause" between

perception and action in which one may more thoughtfully choose how to respond to what is perceived (Kabat-Zinn, 1990; Segal et al., 2002; D. T. Suzuki, 1964). Thus, mindfulness can be considered to be conceptually opposite to automaticity.

Several of the current results are consistent with this understanding. For example, results in Hypothesis 3 suggested that mindfulness is interfered with by negative life events. To the degree to which an increase in frequency and/or severity of stressors provokes automatized reactions, the cognitive load required to interrupt that automaticity with a mindful response should increase. Also, the interaction of the nonjudge facet and negative life events when meditation is controlled for, found in the exploratory analysis, supports this: high nonjudge persons were significantly less distressed than low nonjudge individuals only at low levels of life event stress. This effect would be expected if automatic judgment increases with stress and, by its increase, becomes more difficult to interrupt with mindful practices.

Hypothesis 4 also points to the possibility that automaticity is the common factor accounting for an indirect effect of stress on distress. In the FFMQ, the facets of nonjudge and nonreact are comprised of items describing automatic behaviors or their interruption; for example, “In difficult situations, I can pause without immediately reacting” (nonreact) and “I tell myself I shouldn’t be thinking the way I’m thinking” (nonjudge, reverse scored). The facet actaware also has components of automaticity, e.g., “It seems I am ‘running on automatic’ without much awareness of what I’m doing” (reverse scored). The results in Hypothesis 4 indicate that each of these facets

account for a small part of the relationship between stress and distress, and what they have in common is a measure of the degree to which an individual interrupts, or pauses, her automatic behaviors to attend intentionally to herself or her situation.

The three-way interaction in the observe facet from Hypothesis 5 is also consistent with this argument. Items in the observe facet make little distinction between automatic, habitual observation and more intentional, mindful observation, for example, "I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing." An individual could endorse this item regardless of how he judged or reacted to his audition. On the other hand, at the group level, the facet's interaction at high stress levels with meditation status points to differential automation of judgment and reactivity between meditators and everyone else.

These results suggest that the beneficial effects reported by mindful meditators may be due in part to development of what practitioners call "detachment" (D. T. Suzuki, 1964; S. Suzuki, 1970) which has the effect of interrupting automatic responses. An example of meditation exercises focusing on detachment is observing one's thoughts and feelings, and practicing responding to them as though they were clouds floating through the sky or leaves drifting on a quiet river: they come into awareness and, if left alone, they drift out again. In other words, rather than having a thought or emotion and automatically responding to it, one observes it and simply allows it to be. For example, you get angry at someone who cut you off while driving and then think in response "I shouldn't be so short-tempered; I need to learn to relax behind the wheel." A detached

response is designed to interrupt the automatic reaction and judgment: you got cut off and that's it. The current results suggest that the development of detachment is an important component of mindfulness training and that interrupting automaticity is a key mechanism in its effectiveness.

This detached perspective is a distinguishing factor between standard cognitive therapy treatments and emerging mindfulness-based, "third-wave" (Hayes, 2004) approaches. Treatments such as MBCT (Segal et al., 2002), DBT (Linehan, 1993a, 1993b), and Acceptance and Commitment Therapy (ACT; Hayes, 2004) discuss cognitive phenomena, but instead of attempting to change cognitions by replacing negative self-talk with positive, or through reframing, they train patients to develop a detached, and effectively accepting, relationship to otherwise dysfunctional cognitive phenomena.

Limitations

An important qualification should be made to my discussion of automaticity. Although the results are consistent with my arguments, they remain speculative because I have no direct measure of automaticity. There are potential proxies for this, which I touch on below, but the current study at best suggests that testing automaticity as a potential way of understanding mindfulness' mechanisms could be fruitful, but it does not provide evidence that automaticity is involved.

This research is cross-sectional and, therefore, causality cannot be established. This applies specifically in several places. In Hypotheses 1, 2, and 5, cross-sectional models cannot determine if high distress is caused by increases in negative life events and

if it is decreased by mindfulness or meditation. Perhaps some version of the reverse is the case: in the cases of meditation and mindfulness with distress, one might imagine that having fewer distress symptoms could make it easier to meditate and to be mindful. Although mindful meditation does not emphasize it, it nonetheless requires a certain amount of concentration. Many distress symptoms could make concentration more difficult, such as dizziness, nausea, tingling, or restlessness; indeed, a general decrease in ability to concentrate is a symptom of distress. These could result in a meditator feeling she is less effective in her practice. Other distress symptoms may overlap with reactivity and/or increase cognitive processing load, such as increased irritability, free-floating fears, and depressed mood (reactivity), or increased checking, suicidal thoughts, or increased rumination (cognitive load). If mindfulness entails detachment, increases or decreases in these symptoms could affect mindfulness levels, resulting in a causal chain in the opposite direction of that argued here. Additionally, a third unaccounted for variable affecting distress, mindfulness, and/or meditation could also produce these relationships.

In Hypothesis 3, it it is argued that high life event stress lowers mindfulness, but the reverse may actually be the case. For example, one could imagine that being mindful could reduce the perceived frequency of negative life events. A more mindful, and therefore presumably more equanimous, individual might be less likely to classify a given occurrence as significant; the loss of a job, for example, that might be experienced as impactful by most persons might be taken more in stride by someone better able to

take a detached perspective and, thus, result in a different rating on a life events survey. It is also conceivable that greater mindfulness could reduce the actual frequency of life events. A person who is more mindful would be expected to be more aware. If we take driving as an example, a mindful motorist might be more likely to notice and respond to dangerous traffic situations than a non-mindful one; if so, and all else being equal, it is possible that such a driver would be involved in fewer accidents. Similarly, it might make sense that a more mindful person navigating life would be less likely to find themselves caught unaware by circumstances and perhaps be more likely to plan well, thus more easily avoiding self-inflicted injury, literal or figurative. In contrast, less mindful people might be expected to have more "drama" in their lives, due to a combination of lower awareness and greater reactivity. It is also possible that a third variable, such as personality structure, could produce both low mindfulness and high negative life events.

In Hypothesis 4, determining mediation entails a temporal component which the current study lacks, an example of which here might be establishing that negative life events occur before changes in mindfulness, which in turn occur before manifestation of distress symptoms; with the cross-sectional structure of the current study, no such causal chain can be demonstrated. Nonetheless, while clear causality cannot be determined from the current designs, results are consistent with causal models, which can be tested in future experimental studies.

These data were analyzed multiple times in several different ways; such analyses present an increased risk of Type I error. It is important to bear in mind when interpreting these outcomes that, while most of the results had very small p-values, some, such as the two-way interactions in the exploratory analyses, were large enough that a Bonferroni correction would have rendered them non-significant.

It was suggested that including only negatively valenced events in analyses of life event survey data may confound these data with distress. The possibility that this may be the case in the current research is difficult to test, as the relationship of interest is between negative life events and distress. The relationship of all life events, i.e., those rated by participants as positive, neutral, and negative, with distress in the current study is weaker than that of distress with only negative life events. This seems at least in part to be due to an increase variance in the life event data when positive and neutral events are added: positively, neutrally, and negatively valanced events do not hang together, so to speak, introducing greater inconsistency into the dataset and, thus, weakening the relationship with distress. This occurs whether valance scores are included or only a simple unvalanced count of events is used. More to the purpose of this research, the effect of negative life events was of particular interest because of the hypothesized mechanisms of mindfulness involving the balance between automatic processes and cognitive load. Implicit in these arguments is the idea that, while negative life events precipitate automatic processes that add cognitive load, positive life events may both add and reduce cognitive load by the addition of revitalizing experience. In other words, although a

wedding may be stressful, it may also be a time of great joy; this joy may have the effect of counteracting the stresses entailed in a wedding and so making the effect on the newlywed measurable by the current research tools less clear. In sum, negatively valenced life events were parsed out from the current data to provide a clearer dataset more relevant to the study questions.

Another potentially significant limitation of this study is based on the assumption that persons self-reporting mindfulness have no systematic variation in their ability to assess their levels of mindfulness skills. Based on the work of Dunning and colleagues (Dunning, Heath, & Suls, 2004; Kruger & Dunning, 1999) on self-assessment, this is a poor assumption. This work has demonstrated that, when one is assessing one's ability to perform a complex and novel skill, a relatively high level of that skill is required for an accurate assessment. As a result, those with little ability in the area of interest tend to underestimate the difficulty and complexity of the task and, therefore, overestimate their skill at it. It seems likely that this would apply to mindfulness self-assessment, for example, a certain amount of attentiveness would be required to know how often one operates on autopilot (actaware). Similarly, poor observation skills would be expected to interfere with a good assessment of one's ability to observe. In Kruger and Dunning (1999), the relationship between assessed skill and actual skill was flatter than expected overall and a little curved: at the low- to mid-skill levels, self-assessments were too high, while at the very-high-skill levels, they were a bit low. Given this, it would be expected that effects based on self-assessment of mindfulness would be weaker than they would be

if assessed accurately; given that effects are found even with this presumed flaw, it is worth continuing to study mindfulness and its relationship with other variables, and to strive to refine its assessment. In any case, there is as yet insufficient agreement on how to operationalize mindfulness to permit development of a useful objective assessment, such as a task-based assessment or interview, so we remain limited to self-report.

Further Work

Several opportunities for further research are indicated here. First, regarding the issue of causality, longitudinal experiments in which meditators' experiences are observed over time could shed light on the relationship between meditation, mindfulness, life events, and distress. Ideally, data from age-, sex-, and ethnicity-matched participants randomly assigned to be meditators or non-meditators tested annually for several years would be compared both cross-sectionally and across time points. Such comparisons could verify the current outcomes, track changes over time, and test the relatively long-term causal relationships that might be expected between meditation and mindfulness, and of these two on stress and distress. Testing causality between life events, distress, and mindfulness would probably require a shorter time frame. To learn if, how, and which of these three cause the other(s), a weekly or biweekly testing regimen, repeated for some months, should catch the more rapid fluctuations in stress and distress. A similar design should be able to show the effects of stress and distress on meditation, albeit probably not the other way around, since, as noted above, it would require more

time. This model could also potentially reveal more insight into the meditation and life events interaction in the nonjudge facet of Hypothesis 5.

More direct comparisons of mindfulness to automaticity and the role of each in the stress-distress relationship could be informative. For example, while tracking mindfulness, life event stress, and distress through self-report, the performance of groups of meditators and non-meditators could be compared across mindfulness-primed or neutral cells on a behavioral measure of automaticity, or one that might serve as a proxy such as a continuous performance task (*Conners' continuous performance test (CPTII). Technical guide and software manual*, 2002). Attentional measures like the CPTII may be able to track aspects of mindfulness theorized to relate to automatic behavior, such as the actaware scale, by indicating how much an individual is able to maintain attention over time while performing repetitive but attentionally demanding tasks. Overall, mindfulness and automaticity -- or attentiveness as a proxy -- would be expected to be negatively correlated and to track opposite each other in relation to life event stress and distress. By comparing the relationship between automaticity and the facets of mindfulness among meditators, non-meditators, mindfulness-primed, and unprimed subjects, the degree to which interruption of automaticity serves as a key element of mindfulness may be more finely discerned.

It is possible that mindfulness may act as a mediator between meditation and distress. As discussed above, meditation appears to affect distress through mechanisms other than those entailed by mindfulness. Three of the four criteria for mediation

(meditation affects distress, meditation affects mindfulness, mindfulness affects distress) were met in the current research; the fourth criterion, whether mindfulness accounts for some of the effect, could be tested with a fresh sample. A mediational model could then be used to examine the presumably differential roles of each facet, and to compare the expected indirect effect among meditation techniques other than mindfulness, such as concentrative and lovingkindness (Pace et al., 2009; Valentine & Sweet, 1999). This approach might help identify in a more specific way the mechanisms through which meditation reduces distress.

Positive psychology (Seligman, 1998) posits that health is not merely the absence of illness, but has positive components as well, such as happiness, experience of self-efficacy, satisfying relationships, etc. Mindfulness as a clinical intervention is applied in approaches that address pathology, such as MBSR and MBCT (Kabat-Zinn, 1982; Segal et al., 2002), and those that include or even focus on wellness, like ACT (Hayes, Strosahl, & Wilson, 1999). Given this, it could be useful to examine the relationship between mindfulness and positive psychological outcomes, such as increases in quality of life, relationship satisfaction, physical wellness, self-efficacy and self-esteem, etc. For example, using the current study's models, is there a relationship between negative life events and, say, self-efficacy; if so, does mindfulness moderate that relationship? What about positive life events; do they relate to self-efficacy? Do positive life events predict mindfulness, or, perhaps more interestingly, vice versa?

In summary, the current research replicated the robust, moderate to strong positive relationship between life event stressors and symptoms of distress, as well as the negative and moderate relationship between meditation and distress, and the consistent and somewhat stronger negative relationship between mindfulness and distress. Overall mindfulness and the facets of nonjudge, nonreact, and actaware each exhibited mediational qualities and a mediational model may be a useful approach to understanding how mindfulness appears to aid practitioners in coping with stressors. When tested in the context of the nonjudge facet, meditation interacted with life events to predict different distress outcomes for meditators and non-meditators. Mindful nonjudgment appeared to be sensitive to stress from negative life events, as did nonreactivity and acting with awareness. Further, nonjudgment appeared to be a key factor in distinguishing between highly observant meditators and non-meditators under high life event stress. The three facets of nonjudge, nonreact, and actaware have in common the interruption of automaticity and this commonality may be a key factor in understanding mindfulness' action in its relationship to negative life events and distress symptoms.

APPENDIX

DEMOGRAPHICS & MEDITATION ITEMS

Meditation

a) Do you meditate regularly?

If yes:

b) Briefly describe the kind of meditation you engage in.
c) For how long, in months and years, have you meditated?
d) How many hours per week do you currently meditate?

Demographics

1. What is your age?
2. What is your gender?
3. What is your ethnicity? Please check all that apply:
    1. African or African descent
    2. Arab or Arab descent
    3. East Asian or East Asian descent
    4. European or European descent
    5. Hispanic/Latino(a)
    6. Native American
    7. Non-Arabic Middle-Eastern or similar descent
    8. Pacific Islander
    9. South Asian or South Asian descent
    10. Mixed (please specify)
    11. Other (please specify)

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