MINDFULNESS-BASED STRESS REDUCTION AS AN INTERVENTION AMONG FAMILY CAREGIVERS OF PERSONS WITH NEUROCOGNITIVE DISORDERS

by

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STATEMENT BY AUTHOR

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I would like to dedicate this Master's thesis to the twenty-eight caregivers who generously took the time and effort to participate in the study and who gave so much as they learned stress-reduction techniques in order to become even better caregivers than they already were. I was inspired by the heartbreaking work that the caregivers undertake every day for their loved ones, and felt privileged to observe and learn more from them than I was able to teach as I attempted to support their work with these interventions. I hope, as they do, that the results of this research will, in time, be available to help all caregivers who seek it so that the process of caregiving includes care for the caregiver as well as the care recipient.

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ABSTRACT

Providing care for a frail older adult who is suffering from dementia has been described as a stressful experience that may erode psychological well-being and physical health of caregivers. The burden and stress is increased when the caregivers are themselves elderly. The present study investigated the effectiveness of an 8-week stress-reduction program, Mindfulness-Based Stress Reduction (MBSR), among middle-aged and older family caregivers of persons with neurocognitive disorders, compared with a similarly structured, alternative intervention based on progressive muscle relaxation (PMR). Participants were randomly assigned to either MBSR or PMR (n = 28). The MBSR group showed significantly greater reductions in self-reported levels of depression and isolation from pre- to post-intervention, and those changes remained significant at 8 weeks post-intervention. Both groups showed similar decreases in levels of perceived stress, awakening cortisol levels, cortisol awakening response and daily average cortisol, and in resting systolic blood pressure from pre- to post-intervention. Both groups also reported similar increases in levels of mindfulness and self-compassion. Significant correlations with amount of daily practice of the instructed stress-reduction approaches were observed for several of the dependent measures. Results suggest that MBSR and relaxation-based interventions may both be effective in reducing psychological and physiological indices of chronic stress among older caregivers of relatives with neurocognitive disorders. However, further research, employing waitlist control participants will be necessary for unambiguous interpretation of the present results.

INTRODUCTION

Providing care for a frail older adult has been described as a stressful experience that may erode psychological well-being and physical health of caregivers. When the caregivers are themselves elderly and the care recipient suffers from a neurocognitive disorder such as dementia, the burden and resulting stress is increased.

The Health Consequences of Caregiving for Persons with Neurocognitive Disorders

There is strong consensus that caring for an individual with a neurocognitive disorder such as dementia is burdensome and stressful to family members and contributes to elevated rates of depression, anxiety and distress. In addition, research also suggests that the combination of loss, prolonged distress, the physical demands of caregiving, and caregivers' own biological vulnerabilities may compromise their physiologic functioning and increase their risk for physical health problems. The extent to which caregiving can impact physical health was shown in a study by Schulz and Beach (1999), who found that caregivers reporting significant strain were 63% more likely to die over a 4-year period than a comparable sample of non-caregivers. Subsequent research has identified specific likely contributors to those mortality consequences. Dementia caregivers exhibit a greater risk for developing health problems, particularly hypertension and cardiovascular disease (Mausbach, Patterson, Rabinowitz, Grant, & Schulz, 2007; Shaw et al., 1999). Many of these symptoms may be related to stress occasioned by the nature of patient problem behaviors. Dementia caregivers showed significantly higher levels of cortisol, a hormone known to elevate in response to stress, upon awakening when compared with

non-caregivers, and higher cortisol awakening response (defined as the change in cortisol level from awakening to 30 minutes later) among caregivers of patients with high levels of behavioral and psychological symptoms (de Vugt et al., 2005). Other research has found higher levels of both objective and subjective stressors (patient problem behaviors and perceived caregiving overload, respectively) to be associated with three dimensions of caregiver health: Poorer self-reported health, more negative health behaviors, and greater use of health care services (Son et al., 2007). Also, a combination of increased symptoms of depression and the distress caused as a result of reactions to patient problem behaviors were found to be significant predictors of time to cardiovascular disease (Mausbach, Patterson, Rabinowitz, Grant, & Schulz, 2007).

In contrast, a longitudinal survey showed decreased mortality for elderly spousal caregivers who spent at least fourteen hours a week in active care, independent of care recipient health status (Brown et al., 2009). However, this study was based on survey data from community-based older couples who were capable of independently completing survey information. Therefore, caregivers whose spouses were unable to complete survey questionnaires due to a neurocognitive disorder were excluded. The results may not generalize to the population of caregivers sampled in the present study.

A study of caregivers of persons with Alzheimer's disease (AD) revealed that additional life stress superimposed on the chronic stress of Alzheimer caregiving may elicit a hypercoagulable state—an abnormally increased tendency toward blood clotting—that could contribute to an excess coronary disease rate and increased overall mortality among caregivers (von Känel, Dimsdale, Patterson, & Grant, 2003). Further

research revealed that dementia patients' problem behaviors and the negative appraisals of those behaviors by their elderly spousal caregivers may independently contribute to a chronic low-grade hypercoagulable state (von Känel et al., 2010). In addition, dementia caregivers suffer from a sense of loss and grief, which is experienced during the decline of the patient as well as after the patient's death (Hebert, Dang, & Schulz, 2006; Meuser, Marwit, & Sanders, 2004; Noyes et al., 2009; Sanders, Ott, Kelber, & Noonan, 2007). These and many other findings demonstrate caregivers' vulnerability to the effects of caregiving stress and the critical need for interventions that can alleviate or moderate stress.

Many interventions, involving support groups, individual and family counseling, and education approaches, have been implemented to help caregivers manage their own health and well-being while caring for their loved one. Although caregivers preferred short-term educational programs, extensive training (including intensive long-term education and support services) has been found to give caregivers greater confidence and delay nursing home placement (Doody et al., 2001). One of the most ambitious dementia caregiver intervention projects was the Resources for Enhancing Alzheimer's Caregiver Health (REACH) trial (Schulz et al., 2003), a multi-site study designed to test the effectiveness of various interventions and to evaluate the pooled effects of all interventions combined. One of the most important findings from this study was that interventions that actively engage the caregiver in skill acquisition, aimed at regulating their own behavior, result in significant improvements in caregiver depression.

Mindfulness-Based Stress Reduction (MBSR)

Mindfulness-Based Stress Reduction (MBSR) is a group-based intervention founded upon meditation techniques associated with Buddhist spiritual practice. It combines meditation and other techniques to promote mindfulness, which is described as "the process of observing body and mind intentionally, of letting your experiences unfold from moment to moment and accepting them *as they are*" (Kabat-Zinn, 1990, p. 23). Some previous research has focused on transcendental meditation, a relatively recent form of meditation rooted in the Hindu tradition. Transcendental meditation (TM) is a trademarked form of meditation, introduced in the 1950s, involving sitting quietly and repeating a personalized phrase called a mantra, for 20 minutes twice daily. A review of studies of transcendental meditation indicate that this technique can help to reduce stress and stress-related symptoms, develop internal resources and positive health, prevent ill health (including cardiovascular disease and the deleterious effects of aging) and improve social functioning (Jedrczak, Miller, & Antoniou, 1987). A more recent review of the health benefits of hetereogeneous meditation practices (including TM, MBSR and yoga meditation) suggests that meditation may potentially strengthen neuronal circuits and enhance cognitive reserve capacity, leading to enhanced longevity and optimal health (Xiong & Doraiswamy, 2009). MBSR consists of an eight-week program that teaches people how to use their innate resources and abilities to respond more effectively to stress, pain, and illness (Kabat-Zinn, 1990). The central focus of MBSR is intensive training in mindfulness meditation and its integration into the challenges of everyday life. MBSR evolved from The Stress Reduction Program founded by Dr. Jon Kabat-Zinn at

the University of Massachusetts Medical Center in 1979. Past and ongoing research has shown clinically relevant reductions in medical and psychological symptoms, including pain conditions (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985; Perlman, Salomons, Davidson, & Lutz, 2010), breast and prostate cancer outpatients (Carlson, Speca, Faris, & Patel, 2007; Carlson, Speca, Patel, & Goodey, 2003; Shapiro, Bootzin, Figueredo, Lopez, & Schwartz, 2003; Tacón, Caldera, & Ronaghan, 2004), psoriasis (Kabat-Zinn et al., 1998), rheumatoid arthritis (Pradhan et al., 2007), HIV (Creswell, Myers, Cole, & Irwin, 2009), fibromyalgia (Kaplan, Goldenberg, & Galvin-Nadeau, 1993; Weissbecker et al., 2002), substance abuse (Marcus, Fine, Moeller, & Khan, 2003), acute stress (Nyklícek, Mommersteeg, Van Beugen, Ramakers, & Van Boxtel, 2013), and anxiety and panic disorders (Goldin & Gross, 2010; Kabat-Zinn et al., 1992), among others. In many of these studies, there have been significant reductions in symptoms of depression. In the case of anxiety disorders, the benefits of MBSR have been maintained for up to four years after training (Kabat-Zinn, Lipworth, Burney, & Sellers, 1986; Miller, Fletcher, & Kabat-Zinn, 1995). In addition to reductions in negative symptoms, increases in positive physiological changes and self-reported phenomena have been noted, including improvements in immune function (Davidson, Kabat-Zinn, Schumacher, & Rosenkranz, 2003), health-related quality of life and well-being (Reibel, Greeson, Brainard, & Rosenzweig, 2001; Shapiro, Oman, Thoresen, Plante, & Flinders, 2008), and emotion regulation (Chambers, Gullone, & Allen, 2009; Goldin & Gross, 2010).

Regarding MBSR or any mindfulness meditation-based interventions with elders, Rejeski (2008) states that “mindfulness-based interventions that focus on reconnecting

the mind and body around the theme of acceptance have particular therapeutic value for older adults, because physical symptoms, deteriorating biological systems, chronic disease, caregiving, and suffering are inevitable" (p. 140). However, studies on mindfulness or meditation-based interventions among older adults are rare. One randomized controlled study of transcendental meditation and mindfulness training (which involved a structured word production task) among 73 elders living in a nursing home showed differential improvements in physiological and cognitive measures for both meditation groups over control groups, with significantly greater longevity also seen at three-year follow-up for both groups over controls (Alexander, Langer, Newman, Chandler, & Davies, 1989). More recent data on mindfulness training programs for elders are sparse. A randomized controlled pilot study of MBSR among community-dwelling older adults was found to reduce self-reported loneliness and down-regulated pro-inflammatory NF-kB-related gene expression in circulating leukocytes (Creswell et al., 2012). Qualitative accounts of benefits are also sparse but encouraging. In his experience with mindfulness-based programs with elders in routine clinical practice, Smith (2004) recommends mindfulness training (including Mindfulness-Based Cognitive Therapy (MBCT), which combines MBSR with cognitive therapy, and MBSR) for elders, stating that these programs "may be particularly useful for older people" (p. 423). Among many benefits anecdotally noted by participants, Smith (2004) reports positive behavioral changes such as being more assertive, being freed from reacting in habitual ways, and being more relaxed. In addition, participants reported that they "came to generally like themselves better" (Smith, 2004, p. 427). Older adults who participated in an eight-week

MBCT program had significant improvements in emotional well-being and mindfulness, with moderate effect size reductions in symptoms of depression, anxiety and stress (Splevins, Smith, & Simpson, 2009). Beneficial effects of mindfulness meditation on pain, attention, sleep, and a sense of well-being were reported in a qualitative study of older adults with chronic low back pain (Morone, Lynch, Greco, Tindle, & Weiner, 2008).

Mindfulness-based interventions among middle-aged and older family caregivers of persons with dementia and other neurocognitive disorders are equally rare, yet also encouraging. Anecdotal reports of benefits from mindfulness-based training for elderly caregivers of the frail elderly (and for their care recipients) are available. Benefits for nursing home residents have been described as including feeling less sadness and less physical pain, reconnecting with their spiritual heritage, with the greatest benefit attributed by participants to the shared group experience (McBee, 2003). A pilot study that examined the effects of yoga-meditation training with female dementia caregivers (mean age = 56) showed significant reductions in depression and anxiety and improvements in perceived self-efficacy (Waelde, Thompson, & Gallagher-Thompson, 2004). Retrospective data analysis of 141 elders who completed minimally modified MBSR training had a greater than 50 percent reduction in the number of elders reporting clinically significant depression and anxiety (Young & Baime, 2010). Similar decreases in self-reported symptoms of depression, burden and stress, with further decreases in stress and burden seen at one-month follow-up were also reported with a modified version of MBSR (Epstein-Lubow, McBee, Darling, Armey, and Miller, 2011). However,

another study found that similar decreases in perceived burden were not maintained four months post-intervention (Franco, Sola, & Justo, 2010). An extended, qualitative pilot evaluation of MBCT to prevent relapse of recurrent depression among 30 elders (mean age = 70) described a slight decrease in mean scores on the Beck Depression Inventory II (BDI-II) at post-intervention and a further decrease at one-year follow-up (Smith, Graham, & Senthinathan, 2007). Among a broad range of benefits reported by participants in the Smith et al. study, 48 percent reported that MBCT was a "major benefit to my life", (p. 350) and at one-year post-intervention, 61 percent endorsed this statement. Unfortunately, the above-described studies have several methodological shortcomings. These include small numbers of participants, no active or waitlist control groups as comparison, and no use of randomized controlled research designs. The only randomized, controlled trial of MBCT among older caregivers of relatives with dementia showed a significant decrease in self-reported stress from pre- to post-intervention for both active intervention groups over a respite-only control group (the second active intervention group consisted of an education class on caregiving strategies) (Oken et al., 2010).

To date, no empirical studies have been published that evaluate the effectiveness of MBSR among middle-aged and older family caregivers of persons with neurocognitive disorders. The present study aimed to ascertain whether MBSR is a uniquely effective intervention for middle-aged and older family caregivers of persons with dementia and other neurocognitive disorders. The eight-week MBSR intervention was compared with a similarly structured, body-focused, active intervention based on progressive muscle

relaxation and autogenic training (PMR). The specific questions this study attempted to answer are:

1. Does MBSR decrease perceived levels of stress and depression to a greater extent when compared to the active control condition (PMR)?
2. Does MBSR increase perceived levels of dispositional mindfulness or self-compassion to a greater extent when compared to the active control condition (PMR)?

The present study hypothesized that: a) Perceived levels of stress would decrease for MBSR from pre- to post-intervention to a greater extent when compared to PMR (hypothesis #1); b) Perceived symptoms of depression would decrease for MBSR from pre- to post-intervention to a greater extent when compared to PMR (hypothesis #2); c) Self-reported dispositional mindfulness would increase for MBSR from pre- to post-intervention to a greater extent when compared with PMR (hypothesis #3); and d) Perceived levels of self-compassion would increase for MBSR from pre- to post-intervention to a greater extent when compared with PMR (hypothesis #4). Secondary hypotheses concerning dependent physiological measures include the following: From pre- to post-training, for both interventions, and to a greater extent for MBSR; resting systolic blood pressure and systolic blood pressure in response to a controlled stressor would decrease to a greater extent when compared with PMR (hypothesis #5), and salivary cortisol levels upon awakening, 30 minutes post-awakening, and diurnally would decrease to a greater extent when compared with PMR (hypothesis

#6). Finally, it was hypothesized that changes from pre- to post-intervention would be sustained at 8 weeks following the end of intervention training.

METHODS

Participants

Participants were recruited through magazine and newspaper advertisements, newsletters and flyers distributed to older adults through community service organizations, geriatric physician offices, and a senior health fair, and presentations made to caregiver support groups, retirement communities, and local chapters of Alzheimer's and Parkinson's disease societies in the greater Tucson community and nearby Green Valley.

Inclusion and exclusion criteria. To meet eligibility criteria for the study, participants were required to be 55 years of age and older, living independently in the community, and a primary family caregiver for a person with a neurocognitive disorder. Participants were also required to be English-speaking, able to adequately read the print size of questionnaires with corrected vision (all questionnaires were printed in 14 point *Times New Roman* font), and able to adequately hear class and audio instructions, with or without a hearing aid. Participants needed to be able to physically attend weekly program classes, and cognitively normal (ascertained via the Mini-Mental State Examination (MMSE, Folstein, Folstein, & McHugh, 1975). In addition to inclusionary criteria, participants were excluded if they had functional impairments that interfered with daily living (determined using two questions derived from the Instrumental Activities of Daily Living (IADL; Lawton & Brody, 1969), active suicidal ideation, were diagnosed with or reported symptoms consistent with clinical depression and were not stabilized with medication, had a diagnosis of post-traumatic stress disorder, a recent or current

psychiatric illness, were engaging in substance abuse or in recent recovery from substance abuse, or had a history of cardiovascular disease or uncontrolled hypertension. Persons who said they had meditation experience were not excluded from participating unless they were actively engaged in daily mindfulness or meditation practices. All primary informal caregivers who met criteria were invited to participate, regardless of whether they were caring for a spouse or life partner, parent, grandparent, sibling, a more distant relative, an in-law, a close friend or a neighbor. Since the role of caregiver is acknowledged to be potentially stressful, it was reasonable to expect that any older person who has taken on the caregiving role for another frail and ill elder, would be vulnerable to stress and its potential impact on health and well-being.

Recruiting and screening. A sample size was calculated to provide 80% power to detect a moderate difference (d = .55) between the MBSR and PMR interventions. This moderate effect size was based on an average of two meta-analyses of MBSR (Grossman, Niemann, Schmidt, & Walach, 2004; Baer, 2003) with outcomes of stress, anxiety, depression, sleep and/or psychological well-being. Using an alpha of .01 and allowing for attrition, this power analysis indicated that 40 participants would need to be recruited into each group.

Numerous strategies were used to inform caregivers about the study. In an early phase of the recruitment process, there was little response to printed advertisements, announcements and newsletters. However, a previously conducted pilot survey on caregiver distress and burden (unpublished) elicited a very good response to brief presentations made directly to elders in their retirement communities and local senior

services community centers. Regularly scheduled meetings such as caregiver support groups were more successful in securing survey completion than planned public presentations and venues such as a health fair, in recruiting interested elders. In general, caregivers were reluctant to learn about the present study unless it was introduced and endorsed by service providers or other caregivers themselves, people who were well known and respected in the community. It became apparent during these presentations that caregivers were almost singularly focused on their care recipient and would not consider an intervention that appeared to only benefit themselves. In addition, a significant number of caregivers felt overwhelmed in their role as caregiver and unable to contemplate an additional commitment. Other caregivers were constrained by the added financial cost and burden of professional care for their loved one while attending classes or by the care recipient's refusal to have a professional caregiver in the home.

Recruiting efforts fell below expectations and resulted in fewer than half of the caregivers who were informed of the study being subsequently enrolled and randomized. Over a three-and-a-half month accrual period, it is estimated that about 100 older adults attended meetings to learn about the study. Of those, a total of 48 called the study hotline to undergo the initial screen. After the initial screen, six were not eligible and fourteen declined to participate. A total of 28 participants (26 females, 2 males) began intervention training. See Figure 1 for details of participant retention and attrition throughout the study. Participants ranged in age from 66 to 88 years (mean age = 71.6, *s.d.* = 6.7). Of those 28 participants, 24 had cared for or were caring for their spouses (two participants

had lost their spouses to death 3 months prior to joining the study), and 4 cared for a parent (mean age of care recipient = 78.25, *s.d.* = 7.9).

Participants who expressed interest in the study were screened by telephone. A pre-screening disclosure and a demographic and health screen was administered to determine eligibility. Eligible elders attended a group orientation meeting, where the full scope of the study and interventions was outlined. This format most efficiently delivered a large amount of information and, by offering an opportunity for questions and ample time to think about the commitment, was expected to reduce attrition. The group format also facilitated a comfortable exit from participation by simply leaving the meeting. After signing consent forms, participants completed a questionnaire packet consisting of a general health and demographics questionnaire, a medical history questionnaire, a credibility/expectancy questionnaire, and the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996). These data were used to confirm eligibility and to determine if any participant reported symptoms consistent with clinical depression. Data were also used after randomization to test for any differences between the groups. Before leaving the meeting, participants received their first questionnaire packet along with verbal instructions for saliva collection. They were instructed to complete the questionnaire packets and collect saliva a day or two before the laboratory assessment where their blood pressure would be measured.

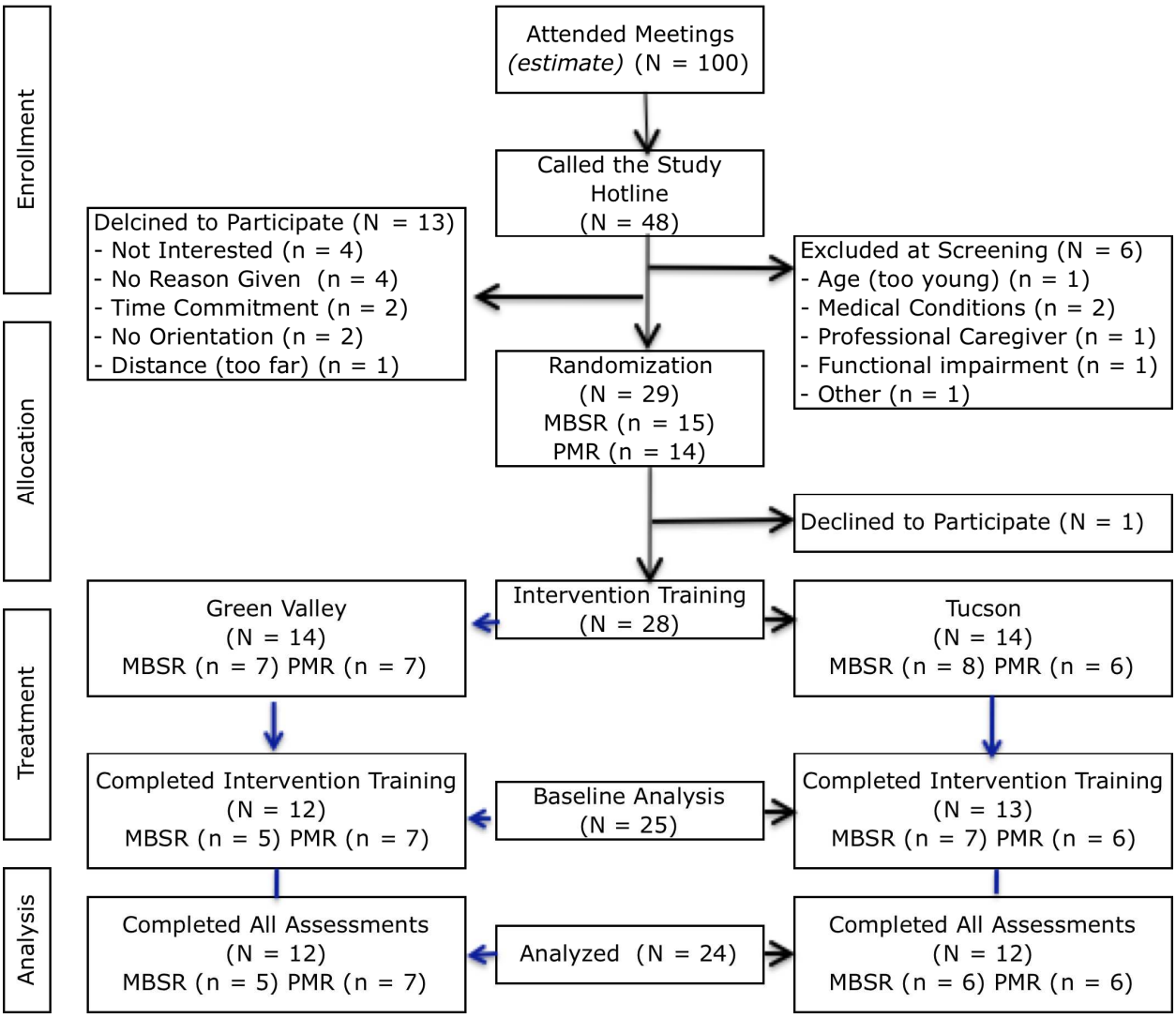

Figure 1. CONSORT flowchart of participants at each phase of study.

Of the 28 participants who began the interventions, 25 completed their respective programs. Two participants, who were in the MBSR group, dropped out after the first class, one was in the process of relocating and the other found the program too great a commitment. A third participant, also in the MBSR group, dropped out after the third class due to her spouse's hospitalization after a fall. Finally, one participant in the PMR group dropped out after completing the intervention training and before the third assessment, stating that she had not kept up with the practices, found it too painful to practice yoga and was feeling depressed. A total of 24 participants thus fully completed the study.

Procedure

After screening and consent, participants were randomized to either the MBSR or PMR interventions. Primary outcome measures were collected via questionnaire packets that participants initially received after signing consent forms, then received either by mail or during class attendance. Questionnaire packets were completed in the comfort of participants' homes before the interventions began (baseline), after the 8-week interventions ended, and at 8 weeks post-intervention. Completed packets were returned either in person or by mail. Salivary cortisol home collection kits were included in the questionnaire packets with written instructions for collection. Blood pressure was measured at baseline, post and 8-week post-intervention visits to the laboratory at the University of Arizona during a controlled emotional stress task. All participants completed daily logs during the intervention training and the 8-week follow-up period, recording the amount of time spent with mindfulness or relaxation practices at home.

Two sets of MBSR and PMR classes were conducted concurrently—one MBSR and PMR class in Tucson and one of each in Green Valley—over a two-month interval. The interventions were taught at local community sites that provide services to seniors. These sites were equipped with parking and meeting facilities and easy access and were familiar to the participants. Each site had yoga equipment (yoga mats, bolsters and blankets) as well as chairs and access to walls for support to facilitate similar experiences with the exercise components of the interventions.

Interventions

Mindfulness-Based Stress Reduction (MBSR). MBSR is an 8-week, structured, skills-based program led by an instructor in a class format. It is a standardized training program for both instructors and participants and includes structured class activities, homework assignments and audio recordings of practices to facilitate home practice. Following the standard program, most of the eight classes were 2.5 hours in length, with the first and final classes being 3 and 3.5 hours long, respectively. This additional time allowed for individual introductions by participants at the beginning of the program and for sharing of overall experiences at the end of the program. In addition to the weekly classes, MBSR included a one-day silent retreat, known as *a day of mindfulness*, lasting 7.5 hours, which occurred on a weekend between weeks 6 and 7. Classes focused on four formal meditative techniques: The body scan, sitting meditation, mindful hatha yoga, and walking meditation, all of which were designed to generate attention to and awareness of the physical body, as well as awareness of emotions and thoughts. The MBSR program

included two sets of hatha yoga postures—one series of standing postures and a second series of lying-down postures—and was practiced with the same attitude of present-moment awareness that was taught in the body scan, sitting and walking meditations. Other components of MBSR included information about stress and its impact on health in addition to working with the dynamic aspects of the group. Each class included opportunities for communication, questions and sharing of experiences with the practices. Through these formal mindfulness practices, participants learned to focus their attention, first on single points, beginning with awareness of breathing, awareness of sounds, awareness of the body and bodily sensations, awareness of emotions and thoughts, and finally expanding to momentary awareness of all stimuli as they presented themselves. This final meditative practice is called "choiceless awareness." During the development of these practices, there was a strong emphasis on employing a foundational attitude of nonjudgmental acceptance of each stimulus or group of stimuli as they occurred. Taken together, the mindfulness practices were designed to cultivate an inherent awareness of oneself, and through them, to develop self-regulatory skills and emotional resilience to life challenges, and to promote positive health behaviors.

Homework included 45–60 minutes of formal practices 6 days a week during the program. Participants received audio recordings of the practices and a home practice manual to aid with homework. In addition to daily formal practice, participants were encouraged to engage in informal practices every day. These informal practices consisted of mindfulness of routine activities such as mindful eating, mindful meal preparation or

mindfully brushing one's teeth. The overall aim of this intensive training was to establish regular mindfulness practices that develop inherent internal resources and life-long self-regulatory skills that could facilitate adaptation to stressors and promote health and well-being.

In the present study, modifications were made to the yoga postures to accommodate limitations of the caregivers. This is consistent with the recommendation that yoga " . . . can be practiced in bed, in a chair, or in a wheelchair. It can be done standing up, lying down, or sitting." (Kabat-Zinn, 1990, p. 100) Another recommendation is to "skip any of the postures that . . . will exacerbate a problem . . ." (Kabat-Zinn, 1990, p. 103) The adaptations that most suited caregivers included utilizing a chair, a bed or a wall as aids to safe practice, and refraining from some postures or practicing them mentally and with awareness in order to continue the mindfulness practice until resuming the posture sequence. In addition, walking meditation instructions were to walk at a normal or slightly slower that normal pace (as opposed to very slowly) to avoid the possibility that a participant might become unstable or lose balance. The only modification outside of the standard MBSR program that was implemented occurred during the Aikido-based communications exercise, which is usually demonstrated by either co-instructors or with the help of a healthy and fit participant. Due to the nature of the exercise and the age of the participants it was decided to demonstrate it with the help of the instructor's assistant. No other modifications were made to the program.

Progressive Muscle Relaxation (PMR). The PMR intervention combined the structure and some components of MBSR with relaxation therapies rather than

mindfulness practices. The relaxation therapies used in PMR were progressive muscle relaxation and autogenic training. The PMR intervention was therefore a similarly structured, skills-based program led by an instructor in a class format, with 8 weekly classes and a day-long "retreat" called a *day of relaxation*. Similar to MBSR, PMR had structured class activities, homework assignments and recordings to facilitate home practice. Autogenic training (Linden, 1994) was considered a good substitute for the body scan in MBSR, progressive relaxation training was substituted for the formal mindfulness practices of MBSR, and gentle hatha yoga—using the same sequence of postures as in MBSR—was substituted for mindful hatha yoga, with an emphasis on posture repetition rather than mindful practice. The didactic stress component of MBSR was also retained in the PMR intervention. Updated AT phrases, e.g., "My right arm is heavy", were used in this study in addition to one phrase for calming the mind ("I am calm and relaxed"), taken from the chapter on Autogenics by Davis, Eshelman and McKay (2008).

Both interventions were taught by the investigator, who is trained in relaxation therapies and is also a trained MBSR instructor. All recordings utilized in both interventions were made by the investigator.

Measures and Data Analytic Approach

The primary outcomes of mindfulness, self-compassion, stress and depression were measured using self-report scales. In addition to these measures, the degree to which the participants felt confident in the interventions was assessed using a questionnaire that measures the credibility of treatments offered. Finally, participants

were given log books to track the amount of time they spent on the various practices on a daily basis. The questionnaire packet included the following instruments.

Credibility Expectancy Questionnaire (CEQ). Credibility of both interventions was assessed using a slightly modified version of the Credibility Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000). The CEQ is a clinical outcome measure that assesses the expectancy and credibility of patients in therapy for the treatment of anxiety, and ensures initial equivalence among compared intervention conditions. As quoted by Devilly and Borkovec (2000, p. 75), credibility is defined by Kazdin as "how believable, convincing, and logical the treatment is", whereas expectancy refers to "improvements that clients believe will be achieved". The credibility factor is cognitively based (these are the first three "think" questions), while the expectancy is more affective in nature (the fourth "think" question and the two "feel" questions). The questionnaire has been demonstrated to have high internal consistency within each factor (Cronbach's alpha credibility scores across three studies ranged from .81 to .86, and expectancy scores ranged from .79 to .90), and the total scale (using both factors) with standardized alpha was between .84 and .85. Good test-retest reliability was also found over a one-week period at .82 for expectancy and .75 for credibility (Devilly & Borkovec, 2000).

Minor modifications were made to the questions to make them appropriate to caregivers' expectancy and credibility in the interventions for reducing symptoms of stress. Modifications included replacing the words "therapy" and "treatment" with the

word “intervention”, and replacing the words “anxiety” and “trauma” with the word “stress” to reflect the intent of the interventions.

The Mindful Attention Awareness Scale (MAAS). Perceived levels of mindfulness were assessed using the Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003). This is a 15-item instrument designed to measure “the presence or absence of attention to and awareness of what is occurring in the present” (Brown & Ryan, 2003, p. 824). It emphasizes this present-moment awareness and avoids other constructs attributed to mindfulness such as acceptance, trust, empathy or gratitude. It has a single factor structure that yields a single score. In several studies totaling 1,253 participants, internal consistency was .82, and test-retest reliability = .81 (Brown & Ryan, 2003). The MAAS correlates well with emotional intelligence as measured by the Trait Meta-Mood Scale ($r = .46$, $p < .0001$) (Salovey, Mayer, Goldman, Turvey, & Palfai, 1995), mindful engagement as measured by the Mindfulness/Mindlessness Scale ($r = .39$, $p < .0001$), and moderately with openness to experience as measured by the NEO Five-Factor Inventory ($r = .18$, $p = .01$) (Brown & Ryan, 2003). Significant negative correlations have been observed with rumination (*p*s < .0001) and social anxiety (*p*s range from < .01 to <.0001) (Brown & Ryan, 2003). Baer, Smith, Hopkins, Krietemeyer, and Toney (2006) found good internal consistency for the MAAS (.86) and significant positive correlations with other self-report measures of mindfulness.

The Self-Compassion Scale (SCS). The Self-Compassion Scale (SCS; Neff, 2003) is designed to capture several attributes, including mindfulness, self-kindness during suffering (as opposed to being harshly critical), and a sense of common humanity,

defined as perceiving experiences as part of the larger human experience. It is considered to be distinct from self-esteem because it lacks the evaluative component of that construct (Neff, 2003). The SCS has 6 factors, measuring self-kindness vs. self-judgment, common humanity vs. isolation, and mindfulness vs. over-identification, which collapse into a single, higher-order factor of self-compassion. Internal consistency for the 26-item instrument is .92, and test-retest reliability is .93 (Neff, 2003). Construct validity was confirmed by comparing the SCS to instruments that measure positive and negative attributes. Significant negative correlations were seen with the self-criticism subscale of the Depressive Experiences Questionnaire (DEQ; Blatt, D'Afflitti, & Quinlan, 1976) ($r = –.65$, $p < .01$). Neff (2003) found that other negative correlations were significant for measures of depression when compared to the Beck Depression Inventory (BDI) ($r = –.51$, $p < .01$), (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), anxiety as measured by the Speilberger State-Trait Anxiety Inventory–Trait form ($r = –.65$, $p < .01$) (Speilberger, Gorsuch, & Lushene, 1970) and perfectionism as measured by the Almost Perfect Scale—Revised ($r = –.57$, $p < .01$) (Slaney, Mobley, Trippi, Ashby, & Johnson, 1996). Neff (2003) also found significant positive correlations with the Social Connectedness Scale ($r = .41$, $p < .01$) (Lee & Robbins, 1995), and emotional intelligence as measured by the Trait Meta-Mood Scale (Salovey et al., 1995), particularly the subscales of Clarity ($r = .43$, $p < .01$), and Repair ($r = .55$, $p < .01$). Finally, Neff (2003) found that the SCS correlated significantly with measures of life satisfaction

(r = .45, p < .01) (Life Satisfaction Scale, Diener, Emmons, Larsen, & Griffin, 1985). Baer et al. (2006) found significant positive correlations between the SCS and five separate mindfulness questionnaires (rs = .36 to.59, ps < .01).

The Perceived Stress Scale (PSS). A global measure of perceived stress using the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) was used to measure the degree to which challenging situations are appraised as stressful. In a population of mostly undergraduate students (N = 510), the average internal reliability of the original, 14-item instrument across three studies was estimated at .85 and test-retest reliability (with a smaller subset after 2 days) at .85 (Cohen, Kamarck, & Mermelstein, 1983). The PSS correlates well with depressive symptoms as measured by the Center for Epidemiologic Studies Depression Scale (CES-D) with correlations across groups of .76 and .65 (p < .001) (Cohen, Kamarck, & Mermelstein, 1983). Correlations with the Physical Symptom Checklist (CHIPS) ranged from .52 to .70 (p < .001) (Cohen, Kamarck, & Mermelstein, 1983). Mitchell, Crane, and Kim (2008) tested the 10-item scale in a population of survivors of suicide (N = 60) and found a reliability coefficient of .91, and split-half reliability of .90. The 10-item version of the PSS was used in this study.

The Geriatric Depression Scale (GDS). Self-reported symptoms of depression were assessed using the Geriatric Depression Scale (GDS; Sheikh & Yesavage, 1986), which has been tested and used extensively with the older population. The original

30-item questionnaire was found to have “excellent properties in screening for depression” in elderly, primary care patients, yielding a sensitivity of 100% and a specificity of 84% with a cutoff score of 10 (Lyness et al., 1997, p. 449). The shorter, 15-item questionnaire which was used in this study correlated well with the long form ($r = .84$, $p < .001$) for self-rating of symptoms of depression (Yesavage & Sheikh, 1986).

Salivary cortisol. Salivary cortisol samples were obtained upon awakening, 30 minutes after awakening, at 4:00 p.m. and 9:00 p.m., one or two days prior to the laboratory assessment. Participants were instructed not to eat, drink, smoke or brush their teeth between the awakening and 30 minutes post-awakening samples, or to eat a large meal within an hour of collecting the afternoon and evening samples. Participants were also instructed to refrain from alcohol the evening before and day of collection. Samples were collected using the passive drool method with straws and stored in small, capped plastic tubes (SaliCap; IBL – Translantic Corp., Toronto, Canada).

Systolic blood pressure. Blood pressure measures were taken twice during each laboratory assessment at the University of Arizona, before the beginning and at the end of an emotional stress test. In the present study, the emotional stress test took the form of a caregiver-specific mental activation task (CMAT), which measured the physiological responses of caregivers as they thought about difficult caregiving experiences with their care recipients. The CMAT was modeled after the four task periods and the divorce-specific mental activation task (DMAT) created by Sbarra, Law, Lee, & Mason (2009). The DMAT was designed to elicit an emotionally stressful response relevant to caregivers’ experience of caregiving, and hypothesized that the response would increase

blood pressure levels. Blood pressure was obtained 4 times at 2-minute intervals at each of the two time points to improve precision of estimates. The blood pressure readings were obtained via the cuff auscultatory method using a digital blood pressure meter (UA-751, Lafayette Instruments, Indiana).

The primary outcome measures and secondary physiological measures were collected on three occasions: Before the interventions began, immediately after the interventions ended, and 8 weeks after the end of the intervention training. The CEQ was administered on two occasions: First, during the orientation meeting after participants had learned about the interventions and signed consent forms, and again at the beginning of the second class of each intervention. Secondary physiological outcomes were measured at the Neuropsychology, Emotion and Meditation Laboratory at The University of Arizona, to complement the self-reported stress results.

Study design and rationale for control condition selection. The study design originally included both active and passive controls, with a passive or waitlist arm of the study intended to be re-randomized into a second stage of intervention training following the recycled waitlist design used by Gross et al. (2009). However, given the actual recruitment achieved for the study, the three-group design would have resulted in greatly reduced statistical power for testing differences between the groups, given estimated likely effect sizes. Since MBSR has already been shown to have benefits for a variety of conditions, it was a reasonable expectation that MBSR would be more beneficial than no intervention. The more interesting question would be whether MBSR was as beneficial or more beneficial as existing and established relaxation or anxiety-reducing therapies. This

potentially beneficial active control condition would justify the significant time commitment required of participants and, with similar characteristics, including class time, homework, instructor and staff contact, was reasonably expected to be beneficial and thereby counter resistance to being randomized. Thus, the final study design was a 2 by 3 mixed model repeated measures design (two independent intervention groups with three assessments—before, after, and at eight weeks after the interventions).

Statistical analysis. Independent-samples *t*-tests were used to determine demographic differences. One-way ANOVAs were used to verify homogeneity of variance between the groups. Repeated-measures ANOVAs were used to analyze the main pre-, post- and 8 weeks post-intervention effects and interactions both between and within groups on the self-report and physiological measures. Where necessary, data were log transformed prior to analysis to correct for skewness. Data analyzed were on participants who completed the 8-week interventions and at least two assessments.

RESULTS

Randomization, expectancy, credibility, and intervention veracity. In order to select an equal number of participants for each condition, participant identification numbers were randomly drawn sequentially and alternately placed in one of two groups: MBSR and PMR. A total of 28 randomized participants (14 per group) began intervention training, including 3 who discontinued their training at the early stages (classes 1 and 3). Twenty-five caregivers completed their respective interventions and pre- and post-intervention assessments, and 24 completed all three assessments. The MBSR group had a total of 12 participants who completed training (6 in Tucson, 6 in Green Valley), and the PMR group had 13 participants who completed training (6 in Tucson, 7 in Green Valley). These two groups did not differ significantly on age, gender, level of education achieved, length of illness of the care recipient, or scores on the Mini-Mental State Examination (mean overall score of 28.52, range = 26–30) (see Table 1). Blinding was not possible as the principal investigator taught both interventions and conducted and supervised the assessments. In addition, a few of the caregivers were friends of each other and several met regularly at informal caregiver support groups and discussed their participation in the programs. Courses ran concurrently, necessitating the joining of both MBSR groups for their respective day-long retreat during week 6 of the course. The two PMR groups were also brought together for their day-long relaxation component during week 5 of the course.

Table 1

Baseline Characteristics of Randomized Participants who Completed Trainings and Pre- and Post-Assessments (N = 25)

Characteristic	MBSR Group	PMR Group	Inferential Statistics
Age [mean years (SD)]	70.42 (6.26)	72.15 (7.29)	$t(23) = –0.64$, $p = 0.53$
Gender			$X^2(1) = 2.36$, $p = 0.13$
Female	10	13	
Male	2	0	
Education			$U = 92.5$, $z = 0.83$, $p = 0.44$
Some Trade/Vocational	1	0	
Trade/Vocational Graduate	1	0	
Some College	1	5	
College Graduate	8	2	
Master's/Equivalent	0	6	
Doctoral/Equivalent	1	0	
Care Recipient Length of Illness			$U = 67.5$, $z = –0.59$, $p = 0.57$
13–18 Months	0	2	
19–24 Months	1	0	
25–30 Months	1	2	
31–36 Months	1	1	
37–42 Months	0	0	
43–48 Months	1	0	
4–8 Years	4	5	
9–12 Years	4	2	
13–15 Years	0	1	
Mini-Mental State Examination (MMSE) [mean scores (SD)]	28.75 (1.4)	28.31 (1.0)	$t(23) = 0.89$, $p = 0.38$

Legend: t = Student's t-test; X^2 = Chi-Square test; U = Mann-Whitney test.

The CEQ was administered on two occasions: First, during the orientation meeting after participants had signed consent forms and before randomization, and again at the beginning of the second class of each intervention. One participant did not complete the questionnaire during time 1 (Orientation). A single point estimate for this missing datum was computed using the total participant sample mean score for this participant's missing data. The two response scales utilized in the CEQ (Likert scales of 1–9 and 0–100%) were standardized (each item was converted to z-scores based on the total sample) and the items summed to create each summary measure (credibility and expectancy), following the procedure used by Devilly and Borkovec (2000). Repeated measures Analyses of Variance (ANOVAs) showed the interaction of group by time to be not significant for either measure (F (1, 23) = 1.85, $p > .05$, *ns,* for the credibility composite; F (1, 23) = 3.12, $p > .05$, *ns,* for the expectancy composite). The main effects of time and group were also non-significant for both factors (Time main effect $F(1, 23) = .003$, $p > .05$, *ns,* for the credibility composite, and $F(1, 23) = .005$, $p > .05$, *ns,* for the expectancy composite; Group main effect ($F(1, 23) = 1.82$, $p > .05$, *ns,* for the credibility composite, and $F(1, 23) = 1.39$, $p > .05$, *ns,* for the expectancy composite). These results indicate that there were no reliable differences in expectations or credibility between the two intervention groups prior to randomization, nor after the participants were randomized into groups and familiarized with their respective interventions. Further, there were no overall significant changes in credibility and expectancy ratings from the first to the second data collection sessions. Overall mean raw scores for the credibility composite were high (7 on a scale of 1 to 9), indicating that participants were

confident in recommending the interventions, which they found to be both logical and potentially useful. Scores were similarly above average for the expectancy composite (65%), indicating that participants expected moderate positive improvements in their subjective levels of stress (see Table 2).

Table 2

Credibility and Expectancy Questionnaire (CEQ) Group Credibility and Expectancy Composite Scores at Orientation (Time 1) and Class 2 (Time 2)

Group	n	Raw Mean Score	Standard Deviation
MBSR Credibility Time 1	12	7.166[a]	1.10
PMR Credibility Time 1	13	7.462[a]	1.30
MBSR Expectancy Time 1	12	65.335[b]	17.23
PMR Expectancy Time 1	13	66.026[b]	19.77
MBSR Credibility Time 2	12	6.167[a]	1.62
PMR Credibility Time 2	13	7.231[a]	1.32
MBSR Expectancy Time 2	12	55.486[b]	19.38
PMR Expectancy Time 2	13	70.513[b]	18.10

[a] Raw scores range from 1–9. Higher scores reflect greater credibility.
[b] Raw scores are in percentages. Higher scores reflect greater expectancy.

Veracity of the interventions was assessed by experts in their related fields. The MBSR intervention veracity was assessed via ratings of audio recordings of home practice material by a director of the Oasis Institute for mindfulness-based professional education and training at the Center for Mindfulness, University of Massachusetts Medical School. Veracity of the active control intervention techniques of progressive muscle relaxation and autogenic training were assessed via ratings of audio recordings of home practice material by Carolyn McManus, PT, MS, MA, Program Coordinator at the Swedish Medical Center, Seattle, WA, who has extensive experience in and has produced commercially available professional recordings of these techniques.

Evaluations of veracity to MBSR standard instruction were made for 5 teaching domains for each intervention, as follows: For the MBSR home practice training materials, the teaching domains were: The body scan, 15-minute meditation, 45-minute meditation, Mindful Yoga standing postures, and Mindful Yoga lying down postures. For the PMR home practice training materials, the comparable teaching domains were: Autogenic Training, 16-muscle group PMR, 7-muscle group PMR, 4-muscle group PMR, and recall PMR. In addition to the 5 teaching domains, experts were asked to rate the teaching materials for overall fit to both interventions, so the MBSR material was rated for overall fit to MBSR training standards. The overall evaluation of the audio recordings of MBSR home practice training materials resulted in ratings of the materials as true to the MBSR model, scoring 6 (on a scale of 1 to 7) in 4 of 5 teaching domains and overall fit, and 5 (on the 1–7 scale) on the remaining domain. The PMR audio CDs (also evaluated by the MBSR director of training) were evaluated as not true to the MBSR

model, scoring 2 in all teaching domains and overall fit. The PMR CDs of home practice material were assessed by Carolyn McManus as very true to the PMR model (scores of 7 in all teaching domains and overall fit), and the MBSR CDs were evaluated as not at all true to the PMR model (overall scores of 1).

Participant attendance rates at classes were similarly high for the two groups (MBSR = 93%, PMR = 94%). Since the number of classes attended by each group were not normally distributed (MBSR, $D(12) = 0.33$, $p = .001$, and PMR, $D(13) = 0.37$, $p < .001$), the non-parametric Mann-Whitney U test was employed, and showed that the groups did not differ significantly in attendance ($U = 0.85$, *ns*). Fifteen participants (60%) attended all 9 classes (which included 8 weekly and 1 full day meetings), 6 participants attended 8 classes (24%), 3 attended 7 classes and 1 participant attended 6 classes.

Home practice. Both interventions included daily home practice of the stress-reduction techniques participants learned in their respective interventions. Participants were asked to track the amount of time they spent on home practice between classes. They received log books to track their home practice on a daily basis during the 8 weeks of intervention training and for an additional 8 weeks immediately after the end of the programs. The MBSR Daily Log Books included the following practice categories: Body Scan (45 min), Mindful Sitting (in 15, 20, 30, and 45 minute increments), Mindful Walking (20 min), Gentle Yoga (45 min), and Informal Practice (15 min). The PMR Daily Log Books contained categories specific to the PMR intervention, including: Autogenic Training (30 min), Progressive Muscle Relaxation (16-muscle group (20 min), 7-muscle group (12 min), 4-muscle group (8 min), Recall (5 min), Recall and Counting

(1 min)), following the 1973 instruction manual (Bernstein & Borkovec, 1973), Joint Flexibility Exercise (45 min), and Informal Practice (15 min). Participants were instructed to check the appropriate boxes indicating what types of practices they did and how many minutes they spent each day on those practices. The Daily Log Books for weeks 9 to 16 were similar to the log books for weeks 1 to 8 except in one respect: None of the practices had specified times, allowing for more flexibility of practices and practice times. Participants were instructed to enter the amount of time in minutes into the appropriate boxes for these log books.

For weeks 1 to 8 for the MBSR group, one participant did not return the log book and one participant's log book data was excluded from analyses. This individual's data were excluded because the check marks in the log book were not consistent with weekly instructions for practice. The PMR group had two participants who did not return log books. For weeks 9 to 16, there were 3 Daily Log Books not returned by the MBSR group, and 2 log books that were not returned for the PMR group. Daily home practice times began with 30 minutes for six days for the PMR group and 45 minutes for six days for the MBSR group for week 1, and increased to 60 minutes of daily practice for six days for MBSR and 50 minutes of daily practice for six days for PMR for week 2. Both groups were instructed to practice for 60 minutes per day for six days by week 3. Daily practice continued to be 60 minutes per day thereafter, for 6 days per week during the intervention training, and for 7 days per week for the following 8 weeks. Participants were encouraged to engage in their preferred techniques, and to develop a regular routine of 60 minutes of daily practice.

Since assigned home practice times varied for the groups during weeks 1 and 2, statistical analyses of reported practice time were conducted using average percentage of recommended practice amounts rather than average minute scores. MBSR participants reported an average of 57% of the recommended home practice amounts during the first 8 weeks of intervention training, and 48% of recommended home practice amounts during the following 8 weeks. PMR participants reported an average of 50% of recommended practice amounts for the first 8 weeks and an average of 27% for the following 8 weeks of home practice. However, given the within group variability in home practice, one-way ANOVAs comparing the two groups showed no significant difference for the first 8 weeks of practice, $F(1, 19) = .64$, $p > .05$, *ns,* or the second 8 weeks of practice, $F(1, 18) = 3.99$, $p > .05$, *ns*. A repeated measures ANOVA showed that the interaction of group by time was also not significant, $F(1, 17) = .59$, $p > .05$, *ns*. However, a repeated measures ANOVA revealed a significant main effect of time, with both MBSR and PMR groups showing decreases in home practice time when analyzed using assessment data from the first 8 weeks to the second 8 weeks of practice, $F(1, 17) = 20.03$, $p < .001$. A plot of the reported home practice data illustrates the average weekly practice time decreases for both groups for weeks 1–8 and 9–16 (see Figure 2).

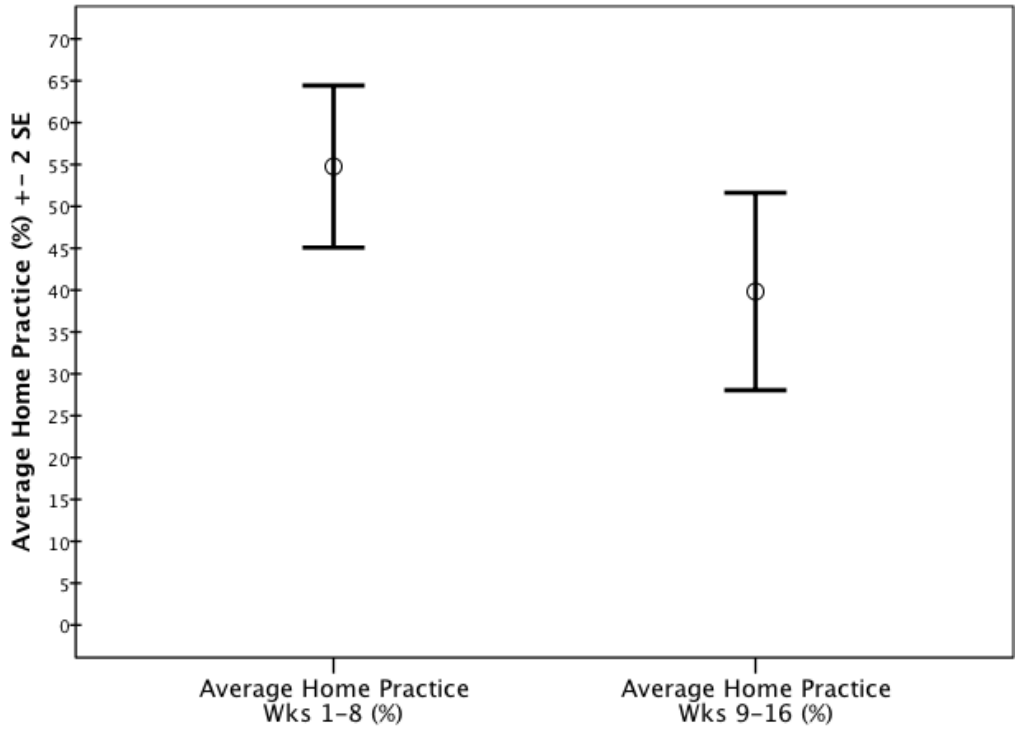

Figure 2. Daily Log Book home practice data collapsed across groups. This graph with standard error bars shows average home practice amounts as measured by the daily log books by both MBSR and PMR groups combined together.

Self-reported symptoms of depression. An independent samples *t*-test showed no differences between the groups on GDS scores at pre-intervention, $t(23) = .90$, $p = .38$, *ns*. Since the GDS data were positively skewed, data analyses were conducted using natural log–transformed data. A repeated measures ANOVA revealed a significant interaction between group and time of assessment when analyzed using pre- to post-intervention data, $F(1, 23) = 6.24$, $p = .02$, and in analysis that also included 8-week post-intervention data, $F(2, 42) = 4.43$, $p =. 02$). A repeated measures ANOVA also revealed a significant main effect of time, with both MBSR and PMR groups showing decreases in symptoms of depression when analyzed using pre- to post-intervention data, $F(1, 23) = 15.53$, $p = .001$, and in analysis that also included 8-week post-intervention data, $F(2, 42) = 8.09$, $p =. 001$. Symptom reduction was greater for the MBSR group (see Figure 3). For the MBSR group, the pairwise comparison from pre-intervention to post-intervention was significant, with $p < .001$, and also significant from post-intervention to 8 weeks post-intervention ($p = .02$), and from pre-intervention to 8 weeks post-intervention ($p = .01$). The pairwise comparisions for the PMR group were not significant. Although both groups had an increase in symptoms from immediately post-intervention to the end of the 8-week post-intervention period, the PMR group's scores had returned to their baseline level while the MBSR group's scores remained below baseline. A group by time interaction was significant when analyzed using pre-intervention to 8 weeks post-intervention data, $F(1, 21) = 4.64$, $p = .04$.

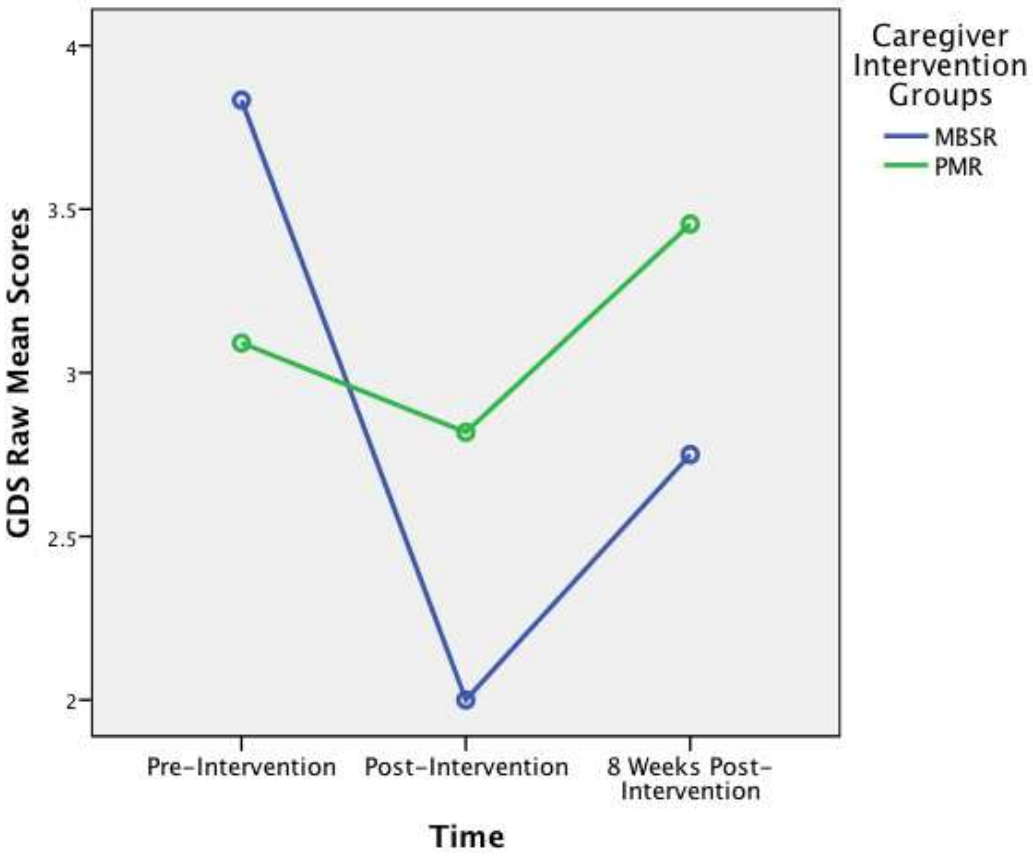

Figure 3. Geriatric Depression Scale (GDS) over three assessments. This line graph shows differences by group of symptoms of depression at pre-intervention, post-intervention, and 8 weeks post-intervention. Note that the interaction from pre- to post-intervention is significant.

The 15-item GDS has a recommended cut-score for identifying clinically significant depression symptoms of 4/5 (Pomeroy, Clark, & Philp, 2001; Yesavage & Sheikh, 1986), which was used in the present study to determine clinically significant depression symptoms for the present sample of participants. Keeping in mind that the GDS is used to screen for symptoms of depression and not for purposes of diagnostic classification, 8 participants (32%) met this cut-score criterion for symptoms indicative of depression at pre-intervention. At post-intervention that number was halved, only 4 participants met those criteria. At 8 weeks post-intervention, a total of 6 participants met criteria for depression. Further examination showed that both groups had 4 participants who met the cut-off for depression at time point 1. By the end of intervention training, the MBSR group had only 1 participant who met depression criteria while the PMR group had 3 participants who still met criteria for depression. At the third assessment, 8 weeks after intervention training ended, the MBSR group had 3 participants with GDS scores meeting or above the cut-score for depression symptoms and the PMR group had 3 participants at or above the cut-score.

For both groups combined, the GDS showed significant correlations with other primary outcome measures. Self-reported levels of depression were significantly positively correlated with perceived levels of stress at pre-intervention, $r(25) = .69$, $p < .001$, post-intervention, $r(25) = .73$, $p < .001$, and 8 weeks post-intervention, $r(23) = .71$, $p < .001$, indicating a robust association between symptoms of depression and perceived stress. The GDS also correlated significantly with self-compassion as measured by the SCS, with moderate negative correlations at pre-intervention,

$r(25) = -.69$, $p < .001$, post-intervention, $r(25) = -.61$, $p = .001$, and the strongest correlation at 8 weeks post-intervention, $r(23) = -.74$, $p < .001$. The GDS also correlated with each subscale of the SCS at each time point (see Table 3).

Exploratory correlational analysis by group showed interesting patterns. Robust positive correlations between depression symptoms and perceived stress were found for both MBSR and PMR groups at all time points. A similar correlation pattern within each group was seen between GDS and SCS at all time points. An interesting pattern of correlations by group was seen between the GDS and the subscales of the SCS. A moderate negative correlation was noted between GDS and the Self-Kindness subscale of the SCS for the MBSR group alone at all time points, while a moderate negative correlation was seen between the GDS and the Common Humanity subscale of the SCS for the PMR group alone at post-intervention and 8 weeks post-intervention. Both the MBSR and PMR groups showed significant negative correlations between depression symptoms and mindfulness as measured by the SCS subscale at pre-intervention and at 8 weeks post-intervention. Positive correlations were seen between depression symptoms and both the Isolation and Over-Identified subscales for the MBSR group at pre-intervention, and for the PMR group at post-intervention and 8 weeks post-intervention. See Table 4 for a complete list of GDS exploratory correlations by group.

Table 3

Bivariate Correlations of Both MBSR and PMR Groups Combined Between the Geriatric Depression Scale (GDS) and the Self-Compassion Scale (SCS) Subscales

SCS Subscales	GDS Time 1	GDS Time 2	GDS Time 3
Self-Kindness	$r(25) = -.52$ $p = .007$	$r(25) = -.48$ $p = .015$	$r(23) = -.57$ $p = .005$
Com. Human.	$r(25) = -.45$ $p = .025$	$r(25) = -.48$ $p = .016$	$r(23) = -.63$ $p = .001$
Mindfulness	$r(25) = -.64$ $p = .001$	$r(25) = -.40$ $p = .047$	$r(23) = -.79$ $p < .001$
Self-Judge	$r(25) = .52$ $p = .008$	$r(25) = .49$ $p = .014$	$r(23) = .55$ $p = .007$
Isolation	$r(25) = .68$ $p < .001$	$r(25) = .66$ $p < .001$	$r(23) = .68$ $p < .001$
Over-Ident.	$r(25) = .58$ $p = .002$	$r(25) = .53$ $p = .007$	$r(23) = .59$ $p = .003$

Note. Time 1 = Pre-Intervention, Time 2 = Post-Intervention, Time 3 = 8 Weeks Post-Intervention.

Although no significant correlation was found between depression symptoms and mindfulness as measured by the MAAS for both groups combined together, separate analyses within each group showed a moderate negative correlation between MAAS mindfulness and symptoms of depression for the MBSR group at 8 weeks post-intervention, $r(12) = -.68$, $p = .01$. A similar pattern was noted for systolic blood pressure (SBP). Although correlations between GDS and SBP were non-significant for both groups combined, correlational analysis for each group separately showed moderate positive correlations between GDS and pre-stress SBP for the MBSR group at all time points, and between GDS and post-stress SBP for the MBSR group at post-intervention (see Table 4). Amount of home practice as measured by the daily log books (DLB) and the GDS were negatively correlated at a level that approached significance with weeks 1–16 (%) at 8 weeks post-intervention, $r(21) = -.41$, $p = .06$, suggesting that the amount of practice of stress-reduction techniques was related to the reduction of depression symptoms.

Table 4

Bivariate Correlations by Group Between the Geriatric Depression Scale (GDS) and the Perceived Stress Scale (PSS), Mindful Attention Awareness Scale (MAAS), Self-Compassion Scale (SCS), and the SCS Subscales

	GDS Time 1 (MBSR)	*p*	GDS Time 2 (MBSR)	*p*	GDS Time 3 (MBSR)	*p*	GDS Time 1 (PMR)	*p*	GDS Time 2 (PMR)	*p*	GDS Time 3 (PMR)	*p*
PSS	$r(12) = .77$	.004	$r(12) = .65$	.023	$r(12) = .69$	.012	$r(13) = .65$	.016	$r(13) = .81$	.001	$r(11) = .74$	.009
SCS	$r(12) = –.78$	.003			$r(12) = –.69$	.014	$r(13) = –.60$	.030	$r(13) = –.72$	.005	$r(11) = –.78$	.004
MAAS					$r(12) = –.68$	.014						
SCS Subscales												
Self-Kindness	$r(12) = –.59$	.042	$r(12) = –.63$	.027	$r(12) = –.60$	.041						
Common Humanity									$r(13) = –.64$	.020	$r(11) = –.73$	.011
Mindfulness	$r(12) = –.72$	.009			$r(12) = –.87$	.001	$r(13) = –.56$	.047	$r(13) = –.55$	.051	$r(11) = –.82$	.002
Self-Judgment												
Isolation	$r(12) = .87$	<.001							$r(13) = .80$	.001	$r(11) = .83$	.002
Over-Identified	$r(12) = .76$	.004							$r(13) = .76$	.003	$r(11) = .66$	.027
Pre-Stress SBP	$r(11) = .66$	.030	$r(11) = .82$	.002	$r(11) = .73$	.010						
Post-Stress SBP			$r(11) = .80$	.003								

Note. Time 1 = Pre-Intervention, Time 2 = Post-Intervention, Time 3 = 8 Weeks Post-Intervention. SBP = Systolic Blood Pressure.

Self-reported levels of stress. For perceived levels of stress, an independent samples *t*-test showed no differences between the groups at pre-intervention, $t(23) = -.06$, $p = .95$, *ns*. Repeated measures ANOVAs showed that the interactions of group by time were not significant when analyzed using pre- to post-intervention data, $F(1, 23) = .41$, $p > .05$, *ns*, or in analysis that also included 8-week post-intervention data, $F(2, 42) = .61$, $p > .05$, *ns*. However, a repeated measures ANOVA revealed a significant main effect of time, with both MBSR and PMR groups showing decreases in perceived levels of stress when analyzed using pre- to post-intervention data, $F(1, 23) = 8.26$, $p = .009$, and in analysis that also included 8-week post-intervention data, $F(2, 42) = 3.13$, $p = .05$ (see Figure 4).

As reported in the GDS results, for both groups combined, perceived levels of stress were significantly positively correlated with self-reported levels of depression at pre-intervention, $r(25) = .69$, $p < .001$, post-intervention, $r(25) = .73$, $p < .001$, and 8 weeks post-intervention, $r(23) = .71$, $p < .001$, indicating a robust association between self-reported symptoms of depression and perceived stress. The PSS also had significant negative correlations with self-compassion as measured by the SCS at pre-intervention, $r(25) = -.65$, $p < .001$, post-intervention, $r(25) = -.66$, $p < .001$, and at 8 weeks post-intervention, $r(23) = -.78$, $p < .001$. There was a significant negative correlation between perceived stress and mindfulness as measured by the MAAS at 8 weeks post-intervention, $r(23) = -.62$, $p = .001$.

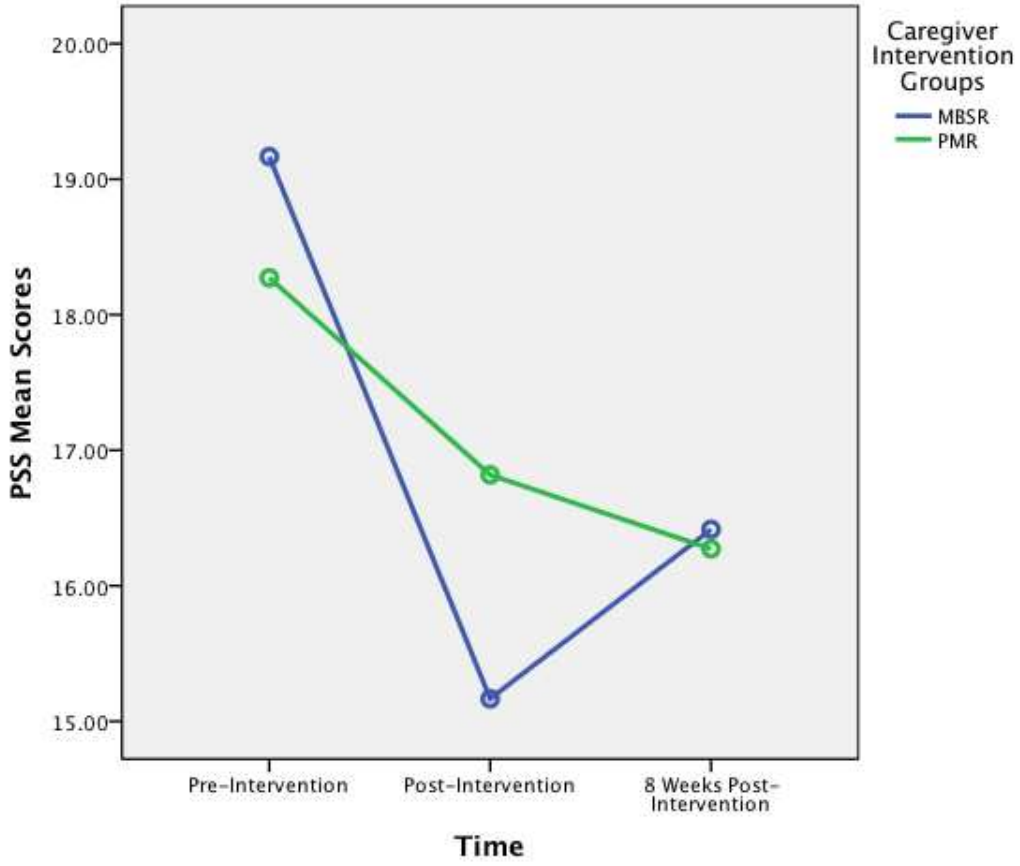

Figure 4. Perceived Stress Scale (PSS) over three assessments. This line graph shows differences by group of perceived levels of stress at pre-intervention, post-intervention, and 8 weeks post-intervention. Note that the apparent interaction from pre- to post-intervention is not significant, given the within-group variability.

Self-reported levels of mindfulness. An independent samples *t*-test showed no differences between the groups on MAAS scores at pre-intervention, $t(23) = -.28$, $p = .78$, *ns*. The group by time interaction effect was not significant, although there was a main effect of time observed. A repeated measures ANOVA revealed a significant main effect of time, with both MBSR and PMR groups showing increases in self-reported dispositional mindfulness when analyzed using pre- to post-intervention data, $F(1, 23) = 11.08$, $p = .003$, and in analysis that also included 8-week post-intervention data, $F(2, 42) = 7.44$, $p = .002$. For both groups combined, there was a positive correlation between mindfulness and self-compassion as measured by the SCS at 8 weeks post-intervention, $r(23) = .48$ $p = .02$. The MAAS also correlated positively with the mindfulness subscale of the SCS at post-intervention, $r(23) = .45$, $p = .03$, and 8 weeks post-intervention, $r(23) = .49$, $p = .02$. In addition, the MAAS approached significance in correlation with levels of perceived stress at post-intervention, $r(25) = -.38$, $p = .059$.

Self-reported levels of self-compassion. An independent samples *t*-test showed no differences between the groups on SCS scores at pre-intervention, $t(23) = -.58$, $p = .57$, *ns*. For the total mean self-compassion scores, the group by time interactions were not significant. However, a repeated measures ANOVA revealed a significant main effect of time, with both MBSR and PMR groups showing increases in self-reported levels of self-compassion when analyzed using pre- to post-intervention data, $F(1, 23) = 10.06$, $p = .004$, and in analysis that also included 8-week post-intervention data, $F(2, 42) = 6.97$, $p = .002$ (see Figure 5).

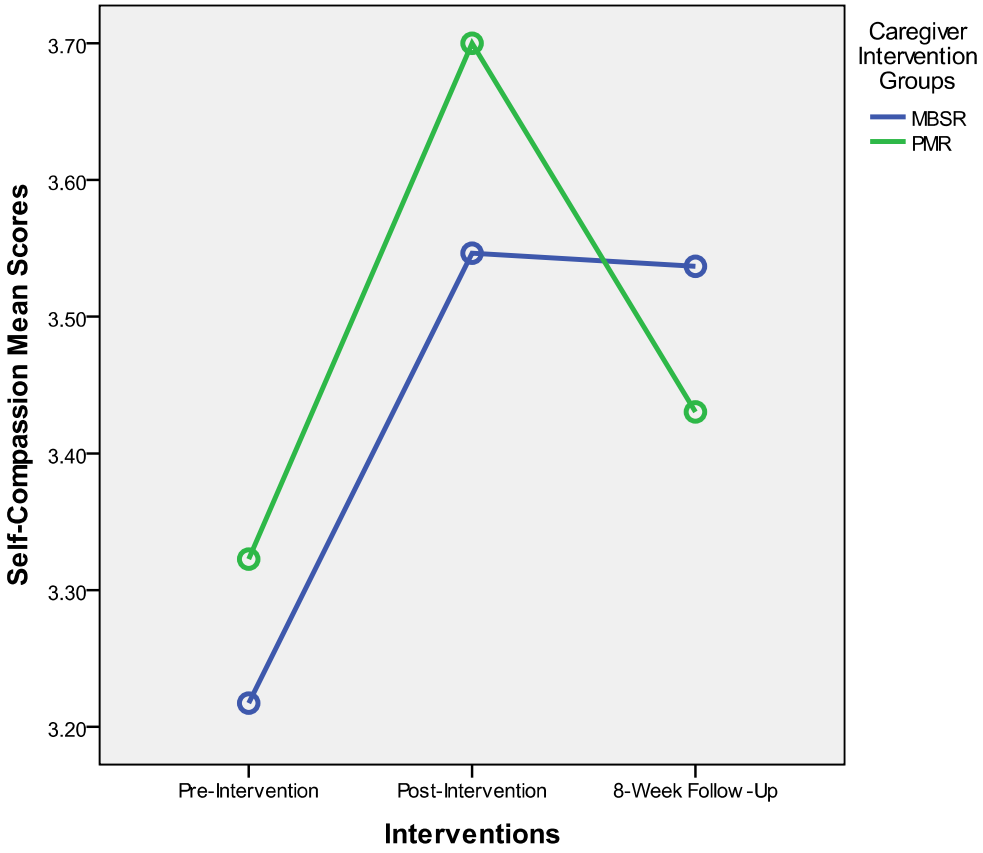

Figure 5. Self-Compassion Scale (SCS) mean scores over three assessments. This line graph shows differences by group of perceived levels of self-compassion at pre-intervention, post-intervention, and 8 weeks post-intervention. Note that the apparent interaction from to post-intervention to 8 weeks post-intervention is not significant.

In addition to the self-compassion mean score, the SCS has 6 subscales, 3 negative (Self-Judgment, Isolation, and Over-Identified) and 3 positive (Self-Kindness, Common Humanity, and Mindfulness). Independent samples *t*-tests showed no differences between the groups on any of the 6 subscales at pre-intervention. Both MBSR and PMR groups reduced their levels of perceived isolation from pre- to post-intervention. However, the MBSR group maintained its improvements by a significantly greater amount at the 8-week follow-up assessment. A group by time interaction was significant for the analysis that included the 8-week post-intervention data, $F(2, 42) = 3.85$, $p = .03$ (see Figure 6). A repeated measures ANOVA also revealed a significant main effect of time, with both MBSR and PMR groups showing decreases in perceived isolation when analyzed using pre- to post-intervention data, $F(1, 23) = 7.47$, $p = .01$, and in analysis that also included 8-week post-intervention data, $F(2, 42) = 4.27$, $p = .02$. Interestingly, although both groups had an increase in self-reported levels of isolation by the 8-week post-intervention period, the PMR group's mean scores had surpassed their baseline levels while the MBSR scores remained below their baseline. The group by time interaction was significant when analyzed using pre-intervention to 8-week post-intervention data, $F(1, 21) = 6.39$, $p = .02$. For the MBSR group, the pairwise comparison from pre-intervention to post-intervention was significant, with $p = .006$, and also significant from pre-intervention to 8 weeks post-intervention ($p = .05$). The pairwise comparision for the PMR group was significant from post-intervention to 8 weeks post-intervention ($p = .01$).

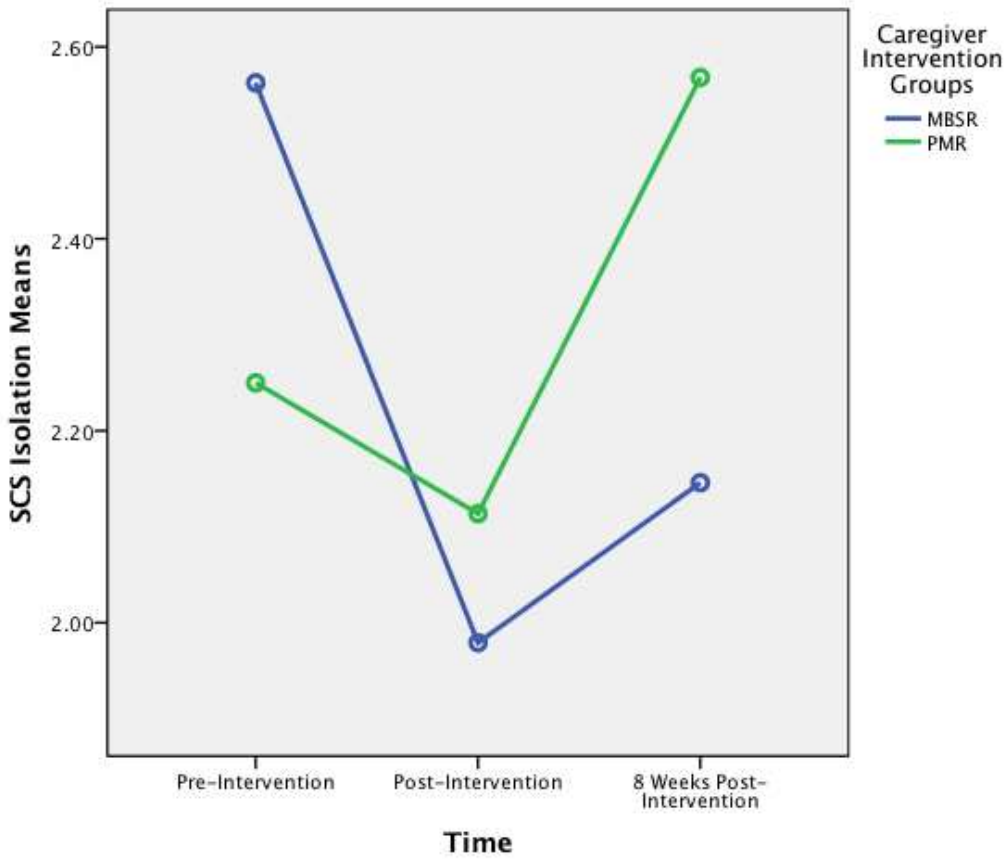

Figure 6. Isolation Subscale of the Self-Compassion Scale (SCS) over three assessments. This line graph shows differences by group of perceived levels of isolation at pre-intervention, post-intervention, and 8 weeks post-intervention. Note that the interaction from pre- to 8 weeks post-intervention is significant.

For both groups combined, levels of self-compassion were significantly negatively correlated at all time points with self-reported levels of depression symptoms ($r(25) = –.69$ $p < .001$ at pre-intervention, $r(25) = –.61$ $p = .001$ at post-intervention, $r(23) = –.74$ $p < .001$ at 8 weeks post-intervention) and perceived stress ($r(25) = –.65$ $p < .001$ at pre-intervention, $r(25) = –.66$ $p < .001$ at post-intervention, $r(23) = –.78$ $p < .001$ at 8 weeks post-intervention). Self-compassion was positively correlated with 1–16 weeks of average home practice at 8 weeks post-intervention, $r(21) = .45$, $p = .04$. Two of the SCS subscales—Self-Kindness and Isolation—were correlated with average home practice. SCS Self-Kindness was positively correlated with weeks 9–16 of average home practice at post-intervention, $r(20) = .47$, $p = .04$, and with weeks 1–16 of average home practice at 8 weeks post-intervention, $r(21) = .45$, $p = .04$, while SCS Isolation was negatively correlated with weeks 1–16 of average home practice at 8 weeks post-intervention, $r(21) = –.50$ $p = .02$. There was a positive correlation between self-compassion and mindfulness as measured by the MAAS at 8 weeks post-intervention, $r(23) = .48$, $p = .02$. Finally, there were moderate positive correlations between the MAAS at post-intervention and the Mindfulness subscale of the SCS at 8 weeks post-intervention, $r(23) = .45$, $p = .03$, and between the MAAS at 8 weeks post-intervention and the SCS Mindfulness subscale at 8 weeks post-intervention, $r(23) = .49$, $p = .02$.

Systolic blood pressure. An independent samples *t*-test showed no differences between the groups on resting systolic blood pressure (mean 3 scores) at pre-intervention, $t(22) = –.56$, $p = .58$, *ns*. Consistent with the relevant secondary hypothesis, there was a

decrease from pre- to post-intervention for both MBSR and PMR groups in resting systolic blood pressure (SBP). One participant was excluded from all blood pressure analyses due to difficulty in securing the blood pressure cuff. Blood pressure was recorded at two-minute intervals four times before and four times after an emotional stress test. These multiple readings were averaged for the recordings taken before, and the group taken after the stress test, discarding for each interval the first SBP reading due to the frequently observed "white coat hypertension" phenomenon (i.e., the tendency for initial recordings to be higher than subsequent recordings) (Helvaci & Seyhanli, 2006). Paired samples *t*-tests that showed significant differences between the SBP means of 3 versus SBP means of 4 readings at the beginning of the laboratory experiment, just prior to the emotional stress test, verified that higher first readings occurred at each assessment, $t(23) = 2.43$, $p = .02$, at pre-intervention, $t(22) = 4.68$, $p < .001$, at post-intervention, and $t(20) = 4.73$, $p < .001$, at 8 weeks post-intervention. Repeated measures ANOVAs also showed significant differences between pre-stress test SBP means and post-stress test SBP means at pre-intervention, post-intervention and 8 weeks post-intervention, confirming the intended effect of the emotional stress test in eliciting a physiological SBP response (see Table 5 for results). Group by time interactions were non-significant. A repeated measures ANOVA revealed a significant main effect of time, with both MBSR and PMR groups showing decreases in systolic blood pressure when analyzed using pre- to post-intervention data, $F(1, 21) = 9.13$, $p = .006$, and in analysis that also included 8-week post-intervention data, $F(2, 38) = 10.99$, $p < .001$, assessments (see Figure 7).

Table 5

Systolic Blood Pressure Pre-Stress Test to Post-Stress Test (Mean 3) at Pre-Intervention, Post-Intervention, and 8 Weeks Post-Intervention

Both Groups*	N	Pre-Stress/ Post-Stress Raw Means (mm Hg)	Pre-Stress (LogN)/SD	Post-Stress (LogN)/SD	Repeated Measures ANOVA
Pre-Intervention	24	123 / 130	4.80 / 0.17	4.87 / 0.18	$F(1, 22) = 16.35$, $p < .001$
Post-Intervention	24	116 / 124	4.75 / 0.16	4.81 / 0.16	$F(1, 21) = 21.04$, $p < .001$
8 Weeks Post	21	109 / 118	4.69 / 0.15	4.78 / 0.16	$F(1, 19) = 29.66$, $p < .001$

* Participant #3 is excluded from these analyses.

Bivariate correlations were significant between SBP and several self-report dependent variables. For both groups combined, post-stress test SBP was positively correlated with PSS perceived stress levels, $r(21) = .46$, $p = .04$, and self-judgment (SCS subscale), $r(21) = .47$, $p = .03$, at 8 weeks post-intervention. There was a negative correlation between post-stress test SBP and self-compassion, $r(21) = –.45$, $p = .04$, at 8 weeks post-intervention. In addition, a negative correlation was observed between post-stress test SBP and the Self-Kindness subscale of the SCS, $r(21) = –.51$, $p = .02$, at 8 weeks post-intervention.

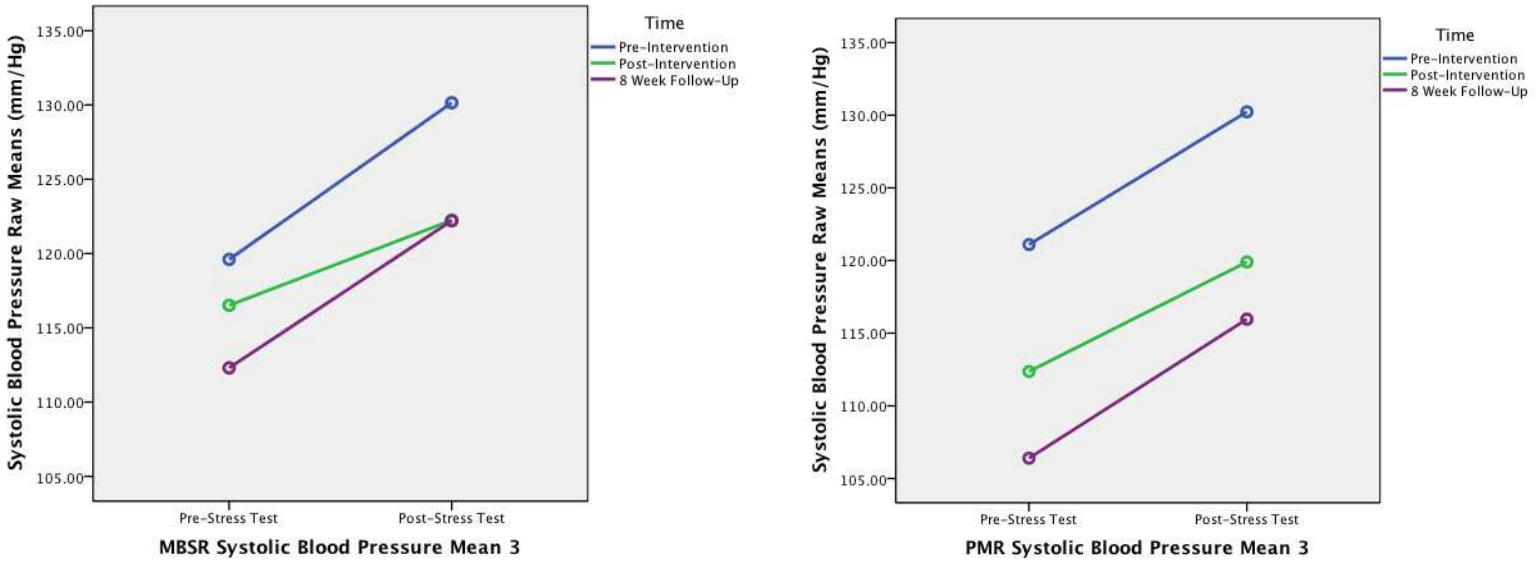

Figure 7. Pre-Stress Test to Post-Stress Test Systolic Blood Pressure (SBP) over three assessments. These line graphs emphasize increases by group of SBP readings (mean of 3) as a result of a controlled laboratory stress test. Overall decreases in SBP at pre-intervention, post-intervention, and 8 weeks post-intervention can also be seen.

Salivary cortisol. Saliva samples were refrigerated, frozen and stored at –20 degrees C until analysis. After thawing, salivettes were centrifuged at 3,000 rpm for 5 minutes, which resulted in a clear supernatant of low viscosity. Salivary concentrations were measured using commercially available chemiluminescence-immunoassay with high sensitivity (IBL International, Hamburg, Germany) and performed by Dr. Clemens Kirschbaum, Technical University of Dresden, Germany. The intra and interassay coefficients for cortisol were below 8%. Cortisol data, measured in nanomoles per liter (nmol/L), were natural log–transformed to normalize distributions. An independent samples *t*-test showed no differences between the groups on Awakening Cortisol scores at pre-intervention, $t(22) = .65$, $p = .52$, *ns*. A repeated measures ANOVA revealed a significant main effect of time, with both MBSR and PMR groups showing decreases in the diurnal cycle of cortisol (awakening, 30-minutes post-awakening, 4:00 p.m. and 9:00 p.m.) when analyzed using pre- to post-intervention data, $F(1, 22) = 5.59$, $p = .03$, and in analysis that also included 8-week post-intervention data, $F(2, 38) = 10.47$, $p < .001$ (see Figure 8).

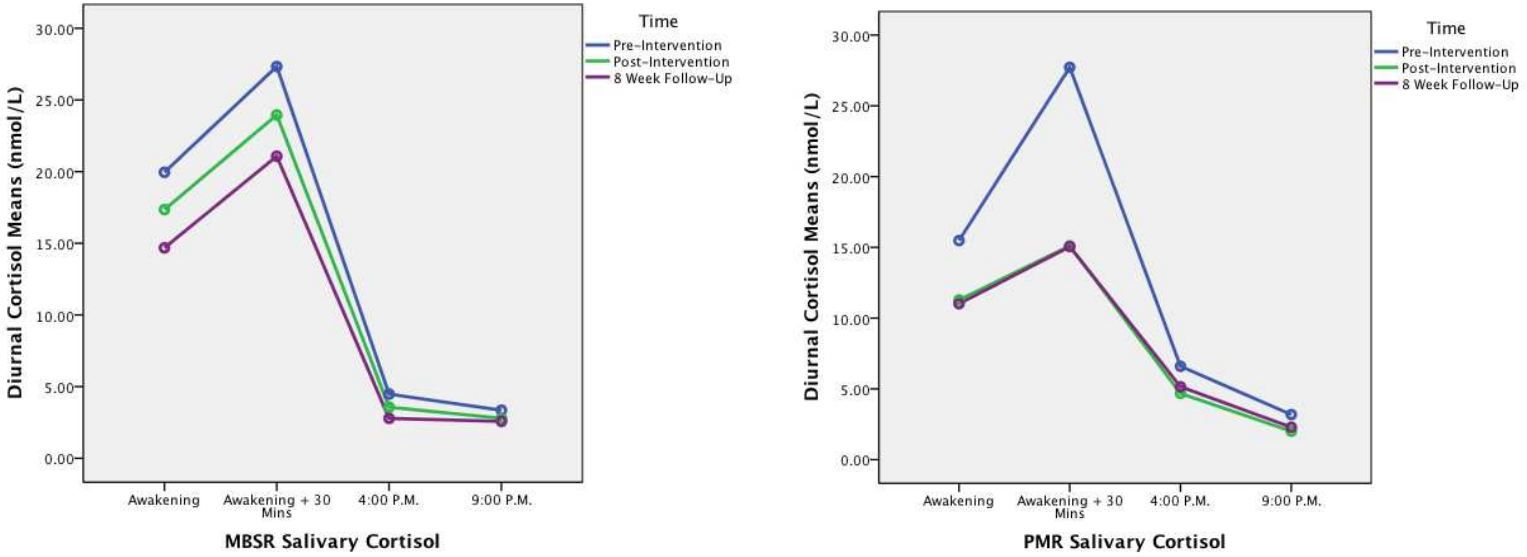

Figure 8. Diurnal cycle of cortisol over three assessments. These line graphs emphasize decreases by group of a cycle of diurnal cortisol readings (awakening, 30 minutes post-awakening, 4:00 p.m., 9:00 p.m.) at pre-intervention, post-intervention, and 8 weeks post-intervention.

The following analyses on cortisol mirror those reported in de Vugt et al. (2005). The home collection of saliva protocol was modeled on this previous study, so as to be able to compare the present observations to these previously published data that are specific to older dementia caregivers. The Cortisol Awakening Response (CAR) is defined as the change in cortisol level from the first to the second sample, which in this case is the 30-minutes post-awakening sample. A repeated measures ANOVA revealed a significant main effect of time, with both MBSR and PMR groups showing decreases in CAR when analyzed using pre- to post-intervention data, $F(1, 22) = 6.79$, $p = .02$, and in analysis that also included 8-week post-intervention data, $F(2, 40) = 9.24$, $p = .001$. No interactions were significant. Cortisol measures taken at Awakening, 4:00 p.m. and 9:00 p.m. (i.e., eliminating the 30-minute post-awakening cortisol peak) were averaged to compute Daily Average Cortisol (DAC). A repeated measures ANOVA revealed a main effect of time that approached significance, with both MBSR and PMR groups showing decreases in DAC when analyzed using pre- to post-intervention data, $F(1, 22) = 3.83$, $p = .06$, and was significant in analysis that also included 8-week post-intervention data, $F(2, 40) = 4.24$, $p = .02$, indicating that average cortisol levels continued to decrease for both groups 8 weeks after intervention training ended (see Figure 9).

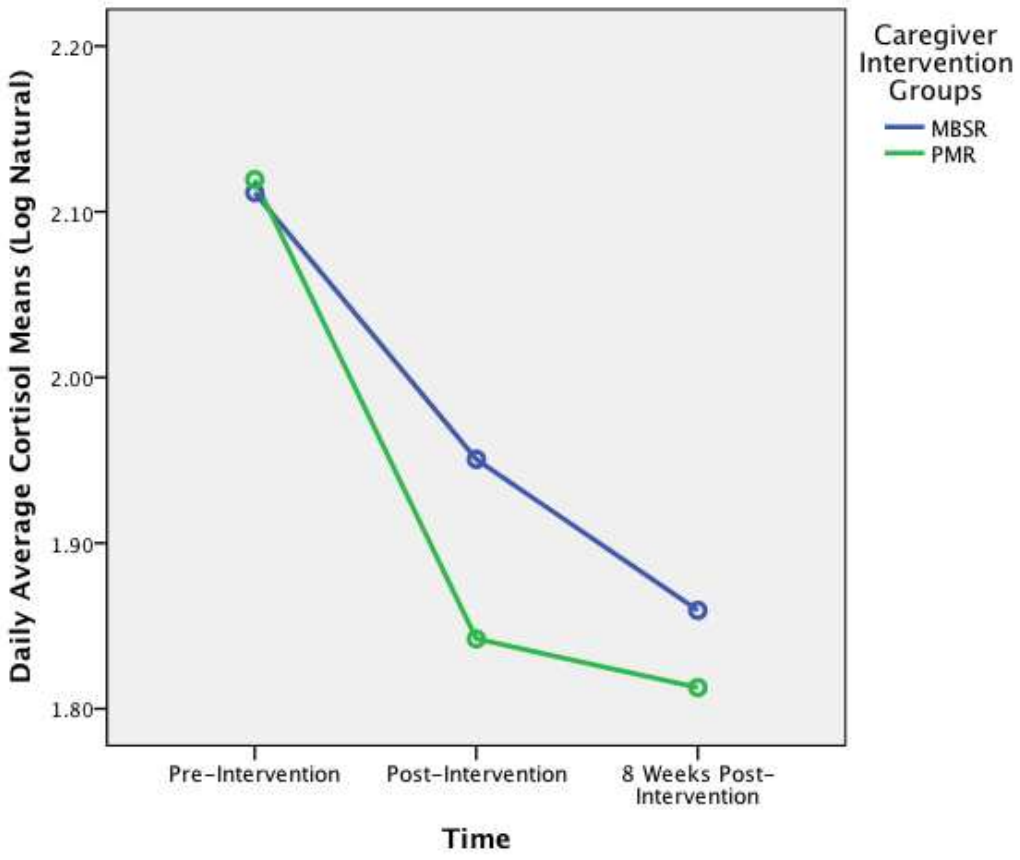

Figure 9. Daily Average Cortisol (DAC) over three assessments. This line graph shows differences by group of an average of 3 salivary cortisol measurements (awakening, 4:00 p.m. and 9:00 p.m.) at pre-intervention, post-intervention, and 8 weeks post-intervention.

Several correlations were observed between cortisol measurements and other dependent variables. For both groups combined, there was a moderate negative correlation between DAC and MAAS at 8 weeks post-intervention, $r(23) = –.43$, $p = .04$. Curiously, positive correlations were seen between cortisol and the SCS as well as with several of the SCS subscales. Positive correlations were noted between CAR and SCS at post-intervention, $r(25) = .43$, $p = .03$, between CAR and SCS Common Humanity at post-intervention, $r(25) = .43$, $p = .03$, between CAR and SCS Mindfulness at post-intervention, $r(25) = .42$, $p = .04$, and between CAR and SCS Self-Kindness at 8 weeks post-intervention, $r(21) = .45$, $p = .04$. In addition, there was a positive correlation between DAC and SCS Self-Kindness at 8 weeks post-intervention, $r(20) = .47$, $p = .04$. Finally, there was a negative correlation between DAC and post-stress test systolic blood pressure at pre-intervention, $r(23) = –.44$, $p = .03$.

Relationship of dependent variables with home practice. Self-reported home practice correlated with several self-report dependent measures for both groups combined. Bivariate correlations of GDS raw total scores at 8 weeks post-intervention approached significance with average home practice amounts at 1–16 weeks, $r(21) = –.41$, $p = .06$. There was a moderate negative correlation between self-reported average home practice amounts over 16 weeks and the PSS at 8 weeks post-intervention, $r(21) = –.49$, $p = .025$. Average home practice also correlated with the Self-Compassion total mean score of the SCS as well as two of its subscales, Self-Kindness and Isolation. Self-compassion was positively correlated with 1–16 weeks of average home practice at 8

weeks post-intervention, $r(21) = .45$, $p = .04$. SCS Self-Kindness was positively correlated with 9–16 weeks of average home practice at post-intervention, $r(20) = .47$, $p = .04$, and with 1–16 weeks of average home practice at 8 weeks post-intervention, $r(21) = .45$, $p = .04$. The SCS Isolation subscale was negatively correlated with 1–16 weeks of average home practice at 8 weeks post-intervention, $r(21) = –.50$, $p = .02$. Bivariate correlations showed that average home practice and changes in systolic blood pressure were not related. Daily average cortisol and awakening cortisol were similarly not correlated with average home practice. However, the cortisol awakening response (CAR) was positively correlated with average home practice at 8 weeks post-intervention for weeks 1–8, $r(19) = .53$, $p = .02$, weeks 9–16, $r(20) = .47$, $p = .04$, and weeks 1–16, $r(21) = .49$, $p = .03$. Further exploratory correlational analyses of dependent variables, including systolic blood pressure, salivary cortisol, and average home practice are contained in the Appendices.

DISCUSSION

The present study, using a randomized controlled trial design, compared MBSR and an active control condition, PMR, as potential approaches for reducing depression and perceived stress in older adults who are caregivers for a relative with dementia. Although previous studies suggest potential benefits of mindfulness-based interventions in reducing symptoms of distress among elderly dementia caregivers (Epstein-Lubow et al., 2001; Oken et al., 2010) and older adults in general (Creswell et al., 2012), this is the first study of older adult caregivers to examine whether the standard MBSR training reduces symptoms of distress associated with the burden of caregiving for an older relative with dementia or other neurocognitive disorder.

Support was found for the first hypothesis that MBSR reduces symptoms of depression to a greater extent than the active control condition of PMR. The second hypothesis, that MBSR would reduce symptoms of perceived stress to a greater degree than PMR, was not supported, since both intervention groups showed similar reductions of stress symptom self-report from pre- to post-intervention. Hypotheses 3 and 4 also were also not supported: Both the MBSR and PMR groups showed similar increases in perceived levels of dispositional mindfulness and self-compassion from pre- to post-intervention. In all four primary dependent variables, a reduction of the magnitude of pre- to post-intervention changes was observed at 8 weeks post-intervention. Two exceptions were noted: The PMR group maintained its decrease in perceived levels of stress and the MBSR group maintained its increase in perceived self-compassion at 8 weeks post-intervention.

In addition to the primary hypotheses investigating depression, perceived stress, perceived dispositional mindfulness, and self-compassion, the secondary hypotheses of this study involved predictions concerning biological measures thought related to stress: Systolic blood pressure and salivary cortisol. Significant reductions in salivary cortisol levels were observed for both the MBSR and PMR groups from pre- to post-intervention, with further decreases for the MBSR group at 8 weeks post-intervention, while PMR maintained its post-intervention decrease at 8 weeks post-intervention. Increasing evidence points to the clinical importance of lowering cortisol levels in older caregivers and other older adults. Elevated awakening levels of salivary cortisol may negatively impact cognitive function in older adults, with awakening levels correlating with poorer scores in executive function and visuoconstructive praxis, verbal fluency and global cognitive measures in those diagnosed with non-amnestic and multi-domain mild cognitive impairment (Venero et al., 2013). In addition, a longitudinal study of 861 older adults (mean age = 74.1) found that, over a 6-year period, high cortisol levels strongly predicted cardiovascular death among those both with and without preexisting cardiovascular disease (Vogelzangs et al., 2010). What is not clear is whether the baseline cortisol levels of the caregivers in the present study were elevated since we did not compare their cortisol levels with older adults who are not caregivers. Neither is it known whether higher awakening cortisol or cortisol awakening response is a good index of chronic stress among older caregivers. However, a previously published comparison of dementia caregivers and sex- , age- and education-matched non-caregivers showed that caregivers had elevated awakening cortisol levels but a blunted cortisol awakening

response relative to non-caregivers, and that caregivers whose relatives had more behavioral symptoms associated with dementia had a slightly higher cortisol awakening response (De Vugt et al., 2005). This suggests that older caregivers may indeed have elevated cortisol levels and could therefore, be at risk for developing depression, cognitive impairments and cardiovascular disease and mortality.

In regard to hypotheses 6, significant reductions in systolic blood pressure levels were observed for both the MBSR and PMR groups from pre- to post-intervention, with further decreases for both groups at 8 weeks post-intervention. Overall, intervention training decreased SBP, while the laboratory stress test resulted in increased SBP. However, the degree to which the stress test increased SBP did not change over time and was not different between the MBSR and PMR groups. This suggests that intervention training may be more tonically relating to systolic blood pressure rather than to phasic increases with stress. The pre-stress test to post-stress test pattern of these results are similar to those of Nyklícek et al. (2013) who showed similar pre-stress test to post-stress test increases in SBP and significant reductions in SBP from pre- to post-intervention with MBSR training among healthy community-dwelling adults when compared with a waitlist control. According to the hypertension guidelines set forth by the World Health Organization, International Society of Hypertension Writing Group (2003), group means of resting systolic blood pressure in the present study were within the normal range (< 140 mm Hg) at pre-intervention (including post-laboratory stress test), and decreased to the optimal range (< 120 mm Hg) by 8 weeks post-intervention. The functional significance of preventing hypertension in adults is well known. Among older spousal

caregivers of patients with Alzheimer's disease, Shaw et al. (1999) found that caregivers had a 67% increased risk of developing borderline hypertension over a 3-year period, when compared with non-caregivers. This finding suggests that older caregivers may be vulnerable to developing hypertension and illnesses related to elevated blood pressure. The observed reductions by both interventions in the present study suggest that clinically meaningful improvements in systolic blood pressure may be possible for older caregivers of relatives with neurocognitive disorders. However, additional research, utilizing the addition of a waitlist control group, would be necessary to evaluate this possibility versus other explanations (e.g., regression to the mean; familiarity over repeated measurement with the BP procedure).

Given that only one of the primary hypotheses (i.e., that regarding depression symptoms), predicting a greater degree of symptom reduction with intervention for the MBSR, in comparison to the PMR group was supported, it is unclear whether either intervention had a specific impact on symptoms of distress. Given the absence of a waitlist control group, and the number of separate dependent variable comparisons, the possibility that the significant group by time (pre- to post-intervention) interaction was due to chance alone cannot be confidently ruled out. However, exploratory correlational analyses did show amount of home practice with the stress reduction skills taught in the intervention to be significantly correlated with perceived stress, isolation, self-compassion, and self-kindness. Further exploratory analyses by group showed additional significant correlations between amount of home practice and self-reported symptoms of depression, self-judgment and mindfulness for the PMR group. The cortisol

awakening response measurement was unexpectedly *positively* correlated with amount of home practice and self-compassion as well as with two of the Self-Compassion subscales (Common Humanity and Mindfulness), posing an interesting question of what this measurement might indicate. Taken together, these correlations, although not allowing for strong causal inference, are consistent with the interpretation that practice with those skills being taught were systematically related to magnitude of symptom change from pre- to post-intervention and at 8 weeks post-intervention. These correlational observations make is less likely that observed pre- to post-intervention changes were the result of such non-specific phenomena as regression to the mean or the Hawthorne effect.

Also of note are the robust correlations between the primary outcome measures. Symptoms of depression had strong positive correlations with levels of perceived stress, and both of those measures had strong negative correlations with levels of self-compassion. It is interesting to note that these measures of depression and distress are inversely related to self-compassion and this contributes to a growing literature exploring distress and self-compassion. Since self-compassion correlations with measures of distress and depression were consistently more robust than correlations with mindfulness as measured by the MAAS and SCS Mindfulness subscale, these results raise the possibility that self-compassion training might possibly be more effective than mindfulness training for reducing distress among older caregivers. This could be tested in future research by increasing the loving-kindness meditation component in MBSR, or using a specific self-compassion training, and this appears a fruitful potential area for future research.

Also of interest is the group by time interaction of the Isolation subscale of the SCS, which was observed 8 weeks after intervention training ended. Although both groups showed decreases in self-reported levels of isolation at post-intervention, and both groups showed an increase in isolation levels by the 8-week post-intervention period, the PMR group's mean scores had surpassed their baseline levels while the MBSR scores remained below their baseline. This result is suggestive of the possibility of differential underlying mechanisms of change in the two groups, with change that appears to progress over time beyond that seen at post-training for the MBSR group. Since isolation is closely linked with loneliness, this finding is consistent with Creswell et al. (2012), who found that an MBSR program reduced loneliness among older adults, when compared with a waitlist control group. In the present study, levels of isolation had strong positive correlations with symptoms of depression and distress and a negative correlation with average home practice, suggesting links with negative affect that may be positively impacted by regular practice of stress-reduction techniques, particularly those taught in the MBSR program. Again, further research will be necessary to specifically test such a hypothesis.

The unexpected correlations of the cortisol awakening response (CAR) measurement with primary outcome variables appear to be anomalous. There was no association between symptoms of depression and perceived stress and CAR, while positive correlations were noted between CAR and self-compassion as measured by the SCS along with all three of the positive SCS subscales. However, according to a

meta-analysis of 147 cross-sectional studies of CAR and psychosocial factors (Chida & Steptoe, 2009), these findings are not inconsistent with other studies. Chida and Steptoe found that in the overall meta-analyses, neither depression, posttraumatic stress syndrome, nor positive psychological states or traits were associated with cortisol changes after awakening, while sub-group meta-analyses showed differential findings (e.g., depression being related to increased and decreased CAR) dependent on methodological quality, data analysis and method of assessment. In general, Chida and Steptoe (2008) found that this particular measurement of cortisol was positively associated with job stress and general life stress, and negatively associated with fatigue, burnout or exhaustion, and recommended that associations between CAR and psychosocial factors be interpreted with caution. The progressive reductions in daily average cortisol levels from pre- to post-intervention and at 8 weeks post-intervention in the present study is consistent with cortisol results of other studies (Carlson et al., 2007) where cortisol levels continued to decrease at 6 months and 1-year post-intervention, and Marcus et al. (2003), who found decreases in cortisol in a therapeutic community. This suggests that MBSR and PMR may be effective interventions for reducing physiological indicators of stress among highly stressed populations. Again, further research employing a waitlist control group would be necessary to adequately test this.

As noted above, a limitation of the present study is the lack of a waitlist control group. Although other studies show significant improvements for MBSR groups when compared to waitlist control groups (e.g., Shapiro, Schwartz, & Bonner, 1998; Creswell et al., 2009, 2012), there are no MBSR versus waitlist control studies among older

caregivers of persons with neurocognitive disorders. Therefore, we do not know how much change—and in which direction—we would observe with caregivers who did not receive stress-reduction training over a 4-month period. A prospective study of chronic stress indices among older dementia caregivers found that caregivers had significantly higher systolic blood pressure at rest than noncaregivers, and despite improvements in symptoms of depression and medical symptoms after placement of their care recipient to skilled nursing care or death, caregivers continued to experience elevated blood pressure (Grant et al., 2002). This suggests that symptoms of distress may not abate for dementia caregivers while they are actively involved with caregiving duties, and some important symptoms may remain after active caregiving obligations have ended.

That the active control condition in the present study, based on relaxation techniques, had mostly similar apparent benefits as the MBSR program is consistent with other MBSR studies that used relaxation as an active control (Agee, Danoff-Burg, & Grant, 2009; Jain et al., 2007), or health or exercise enhancement programs (MacCoon et al., 2011). This raises an interesting question about how relaxation and meditation techniques differ in terms of reducing symptoms of distress. Although every effort was made to teach the two programs with veracity to their respective training models, the investigator (who was the instructor for both interventions) recognizes that bodily awareness, one of the essential components of mindfulness training, was likely achieved as a consequence of the focusing upon tensing and relaxing of the muscle groups of progressive muscle relaxation. In addition, a pervading sense of calmness and peacefulness among PMR participants was observed by the instructor at the end of

autogenic training sessions. Thus, some of the benefits often claimed by mindfulness meditation practices may have been achieved as a secondary effect by the PMR group, despite the fact that these effects were not the primary goal of the PMR training. Subjective awareness of the self, the mind or the body was not an explicit instruction in the PMR intervention. PMR participants were asked how their muscles "felt" after the tension/relaxation sequences, and were asked to share their experiences of the autogenic training technique and the repetition of phrases, rather than focus on their mental processes or physical status. In other words, the separation and nonjudgmental observation of the self during the practices were not discussed in PMR as they are in MBSR, and therefore, would not be consciously sought or explored. Yet similar benefits accrued for both groups. Since there were some differences in outcome between the groups, specifically in symptoms of depression and perceived sense of isolation, it is possible that there may be different underlying mechanisms and the present results are not entirely inconsistent with some specificity of benefits in comparison of the interventions. Future research, including a waitlist control group, on components of both interventions, e.g., individual relaxation techniques and individual components of MBSR (breathing exercises vs. mindfulness meditation vs. lovingkindness meditation vs. mindful movement) delivered via audio recordings or the Internet could begin to tease apart specific aspects of training and such effects as the group experience of bonding and supportive sharing on psychological symptoms of distress.

Another limitation of the present study is that all participants who were recruited into the study were actively engaged in receiving community support services. Attempts

to recruit caregivers who were not involved with community services (via flyers in physician offices) met with little success. In general, recruitment of community-dwelling older caregivers presented a challenge for the present study. Primary deterrents to participation were reported exhaustion and a sense of burnout, the amount of time and commitment involved in participating in the interventions, and the length of the study. In addition, most caregivers who attended informational meetings about the study expressed a reluctance to commit to any program that wasn't focused on the patient. However, those caregivers who did agree to participate reported that they found the interventions to be beneficial. Adherence to the programs was high and attrition rates were low. Participation in group-based interventions for this population might be greatly enhanced if they were consistently available and the importance of self-care for the caregiver was regularly reinforced by community support centers and by medical personnel and other authority figures. In addition, encouraging participation in the early stages of their care-recipient's illness could potentially provide more benefit to both the caregiver and relative as symptoms progressed, and potentially prevent chronic stress and exhaustion. Perhaps ideally, all older caregivers would receive a "prescription" to begin structured caregiver intervention and support programs outlined in an informational packet distributed by the physician's office once a diagnosis of a neurocognitive disorder is confirmed. The testing of such hypotheses require further research.

Also, for this population, ease of access and familiarity with surroundings was described as important for participation and adherence. Participants were comfortable attending classes at senior community centers that they knew and visited regularly and

where their relatives could be cared for nearby. Finally, regular “booster” sessions of meditation classes and other individual components of both interventions (e.g., mindful movement, breathing exercises, didactic coping strategies), some of which could be facilitated by caregivers themselves, might provide ongoing “sangha” support for their individual home practice and an opportunity to maintain informal social connections. The inclusion of such booster sessions in future studies would seem warranted.

Another limitation was that laboratory assessments were conducted at different times throughout the day, and the measures used in these assessments could be subject to diurnal or circadian effects. Future studies could address this by limiting the assessment times to either weekday mornings or afternoons, although weekend days may not be significantly different for retirees.

Both the MBSR and PMR intervention programs showed significant pre- to post-intervention improvements in major indicators of distress and this encourages a continuation of research with MBSR and relaxation-based programs to determine if there is greater improvement compared to a waitlist control group, and whether there is a most advantageous approach to interventions with older caregivers of patients with dementia or other neurocognitive disorders. The present results are encouraging in light of the fact that symptoms of chronic distress tend to worsen over the course of caregiving and even after the death of the care recipient. The MBSR program is well established and comprehensive in its scope, yet could be modified in future research to address specific needs of elderly dementia caregivers. Modifications could include coping strategies for problem behaviors, strategies to facilitate and maintain an individual stress-reduction

practice in the face of the unpredictability and uncertainty that each day can bring. Caregivers often refer to this as “the new normal.” Examples of modifications would primarily be enhancements to the existing program, e.g., how to do multiple short periods of practice throughout the day versus at a fixed time and place, how to practice in a service provider or hospital waiting room, and mindfulness components that address the inevitable transition to skilled care, bereavement and grief.

In summary, this pilot study provides a promising initial suggestion that MBSR and relaxation-based interventions may reduce symptoms of distress among older caregivers of relatives with neurocognitive disorders, which are well-known risk factors for morbidity and mortality (Grant et al., 2002; Schulz & Beach, 1999). MBSR reduced symptoms of depression and perceived isolation from pre- to post-intervention to an extent significantly greater than that observed for PMR, and these gains were sustained at 8 weeks following the end of intervention training. Whether this greater benefit of MBSR is a chance difference, given the number of dependent variable comparisons in the present study, is unknown. It will be important to replicate and extend the present initial findings in larger samples that include both waitlist and active control groups.

APPENDIX A

List of Systolic Blood Pressure Correlations Both Groups and Split File (All raw data)

SBP Variables Correlated With	Pre-Stress SBP (Both Groups)	Post-Stress SBP (Both Groups)	Pre-Stress SBP (MBSR)	Post-Stress SBP (MBSR)	Pre-Stress SBP (PMR)	Post-Stress SBP (PMR)
GDS and PSS T1	None	None	***r*(11)=.66, *p* = .03 (GDS)**	None	None	None
GDS and PSS T2	None	None	***r*(11)=.82, *p* = .002 (GDS)**	***r*(11)=.80, *p* = .003 (GDS)**	None	None
GDS and PSS T3	None	***r*(21)=.46, *p* = .04 (PSS)**	***r*(11)=.73, *p* = .01 (GDS)** ***r*(11)=.63, *p* = .04 (PSS)**	None	None	None
Avg Home Pract T1	None	None	None	None	None	None
Avg Home Pract T2	None	None	None	None	None	None
Avg Home Pract T3	None	None	None	None	None	None
MAAS, SCS, Mind T1	None	None	None	None	None	None
MAAS, SCS, Mind T2	None	None	None	None	None	None
MAAS, SCS, Mind T3	None	***r*(21)= –.45, *p* = .04 (SCS)**	***r*(11)= –.60, *p* = .05 (SCS)** ***r*(11)= –.61, *p* = .05 (SCS Mindful)**	***r*(11)= –.60, *p* = .05 (SCS)**	None	None

SBP Variables Correlated With	**Pre-Stress SBP (Both Groups)**	**Post-Stress SBP (Both Groups)**	**Pre-Stress SBP (MBSR)**	**Post-Stress SBP (MBSR)**	**Pre-Stress SBP (PMR)**	**Post-Stress SBP (PMR)**
SCS Pos Subscales T1	None	None	***r*(11)= –.65, *p* = .03 (Self-Kind)**	***r*(11)= –.60, *p* = .05 (Self-Kind)**	None	None
SCS Pos Subscales T2	None	None	None	None	None	None
SCS Pos Subscales T3	None	***r*(21)= –.51, *p* = .02 (Self-Kind)**	***r*(11)= –.61, *p* = .05 (SCS Mindful)**	None	None	None
SCS Neg Subscales T1	None	None	None	None	None	None
SCS Neg Subscales T2	None	None	None	None	None	None
SCS Neg Subscales T3	None	***r*(21)= .47, *p* = .03 (Self-Judge)**	None	***r*(11)= .62, *p* = .04 (Self-Judge)**	None	None
Cortisol DAC CAR T1	None	***r*(23)= –.44, *p* = .03 (DAC)**	None	None	None	***r*(13)= –.63, *p* = .02 (DAC)**
Cortisol DAC CAR T2	None	None	None	None	None	None
Cortisol DAC CAR T3	None	None	None	None	None	None

GDS = Geriatric Depression Scale
PSS = Perceived Stress Scale
MAAS = Mindful Attention Awareness Scale
SCS = Self-Compassion Scale
SCS Pos Subscales = Self-Kindness, Common Humanity, Mindfulness
SCS Neg Subscales = Self-Judgment, Isolation, Over-Identified
Cortisol DAC = Daily Average Cortisol

T1 = Pre-Intervention
T2 = Post-Intervention
T3 = 8 Weeks Post-Intervention
SBP = Systolic Blood Pressure

Cortisol CAR = Cortisol Awakening Response

APPENDIX B

List of Cortisol Correlations Split File by Group (All raw data)

DLB Correlated With	**Awakening Cortisol (MBSR)**	**Daily Average Cortisol (MBSR)**	**Cort. Awakening Resp (MBSR)**	**Awakening Cortisol (PMR)**	**Daily Average Cortisol (PMR)**	**Cort. Awakening Resp (PMR)**
GDS T1	None	None	None	None	None	None
GDS T2	None	None	None	None	None	None
GDS T3	None	None	None	None	None	None
PSS T1	None	None	None	None	***r*(11) = –.80, *p* = .003**	None
PSS T2	None	None	*r*(12) = –.52, *p* = .08	None	None	None
PSS T3	None	None	None	None	None	None
MAAS T1	None	None	None	None	***r*(13) = –.64, *p* = .02**	None
MAAS T2	None	None	***r*(12) = .58, *p* = .05**	None	None	None
MAAS T3	None	None	None	None	*r*(11) = –.58, *p* = .06	None
SCS T1	None	None	None	None	None	None
SCS T2	None	None	***r*(12) = .71, *p* = .01**	None	None	None
SCS T3	None	None	None	None	None	None
SCS–Self-Kind T1	None	None	None	None	None	None
SCS–Self-Kind T2	None	None	***r*(12) = .64, *p* = .02**	None	None	None
DLB	**Awakening**	**Daily Average**	**Cort. Awakening**	**Awakening**	**Daily Average**	**Cort.**

Correlated With	**Cortisol (MBSR)**	**Cortisol (MBSR)**	**Resp (MBSR)**	**Cortisol (PMR)**	**Cortisol (PMR)**	**Awakening Resp (PMR)**
SCS–Self-Kind T3	None	None	None	None	None	None
SCS–C. Hum T1	None	None	None	None	None	None
SCS–C. Hum T2	None	None	*r*(12) = .54, *p* = .07	None	None	None
SCS–C. Hum T3	***r*(12) = .67, *p* = .02**	None	None	None	None	None
SCS–Mindful T1	None	None	None	None	None	None
SCS–Mindful T2	None	None	***r*(12) = .61, *p* = .04**	None	None	None
SCS–Mindful T3	None	None	None	None	None	None
SCS–Self-Judg T1	None	None	None	None	None	None
SCS–Self-Judg T2	None	None	*r*(12) = **–**.55, *p* = .065	None	None	None
SCS–Self-Judg T3	None	None	None	None	None	None
SCS–Isolation T1	None	None	None	None	None	None
SCS–Isolation T2	None	None	***r*(12) = –.60, *p* = .04**	None	None	None
DLB	**Awakening**	**Daily Average**	**Cort. Awakening**	**Awakening**	**Daily Average**	**Cort.**

Correlated With	**Cortisol (MBSR)**	**Cortisol (MBSR)**	**Resp (MBSR)**	**Cortisol (PMR)**	**Cortisol (PMR)**	**Awakening Resp (PMR)**
SCS−Isolation T3	None	None	None	None	None	None
SCS−O-Ident T1	None	None	None	None	None	None
SCS−O-Ident T2	None	None	***r*(12) = −.62, *p* = .03**	None	None	None
SCS−O-Ident T3	None	None	None	None	None	None
SBP Pre-Str T1	None	None	None	None	*r*(13) = −.51, *p* = .08	*r*(13) = .48, *p* = .09
SBP Pre-Str T2	None	None	None	None	None	None
SBP Pre-Str T3	None	None	None	None	None	None
SBP Post-Str T1	None	None	None	***r*(13) = −.58, *p* = .04**	***r*(13) = −.63, *p* = .02**	None
SBP Post-Str T2	None	None	None	None	None	None
SBP Post-Str T3	*r*(12) = −.55, *p* = .06	None	None	None	None	None

GDS = Geriatric Depression Scale
PSS = Perceived Stress Scale
MAAS = Mindful Attention Awareness Scale
SCS = Self-Compassion Scale
SCS Pos Subscales = Self-Kindness, Common Humanity, Mindfulness
SCS Neg Subscales = Self-Judgment, Isolation, Over-Identified

T1 = Pre-Intervention
T2 = Post-Intervention
T3 = 8 Weeks Post-Intervention

SBP Pre-Str = Systolic Blood Pressure Pre-Stress
SBP Post-Str = Systolic Blood Pressure Post-Stress

APPENDIX C

List of Average Home Practice (Daily Log Book) Correlations Split File by Group (All raw data)

DLB Correlated With	**DLB Weeks 1–8 % (MBSR)**	**DLB Weeks 9–16 % (MBSR)**	**DLB Weeks 1–16 % (MBSR)**	**DLB Weeks 1–8 % (PMR)**	**DLB Weeks 9–16 % (PMR)**	**DLB Weeks 1–16 % (PMR)**
GDS T1	None	None	None	None	None	None
GDS T2	None	None	None	None	None	None
GDS T3	None	None	None	None	***r*(11) = –.61, *p* = .045**	***r*(11) = –.68, *p* = .02**
PSS T1	None	None	None	None	***r*(11) = –.80, *p* = .003**	None
PSS T2	None	None	None	*r*(11) = –.55, *p* = .08	None	None
PSS T3	None	None	None	***r*(9) = –.66, *p* = .055**	***r*(11) = –.72, *p* = .01**	***r*(11) = –.74, *p* = .01**
MAAS T1	None	None	None	None	None	None
MAAS T2	None	None	None	None	None	None
MAAS T3	None	None	None	None	None	None
SCS T1	None	None	None	None	None	None
SCS T2	None	None	None	None	None	None
SCS T3	None	None	None	*r*(9) = .64, *p* = .065	*r*(11) = .58, *p* = .06	***r*(11) = .65, *p* = .03**
SCS–Self-Kind T1	None	None	None	None	None	None
SCS–Self-Kind T2	None	None	None	None	None	None
SCS–Self-Kind T3	None	None	None	*r*(9) = .65, *p* = .06	***r*(11) = .78, *p* = .004**	***r*(11) = .79, *p* = .004**

DLB Correlated With	**DLB Weeks 1–8 % (MBSR)**	**DLB Weeks 9–16 % (MBSR)**	**DLB Weeks 1–16 % (MBSR)**	**DLB Weeks 1–8 % (PMR)**	**DLB Weeks 9–16 % (PMR)**	**DLB Weeks 1–16 % (PMR)**
SCS–C. Hum T1	None	None	None	None	None	None
SCS–C. Hum T2	None	None	None	None	None	None
SCS–C. Hum T3	None	None	None	$r(9) = .60$, $p = .09$	None	$r(11) = .57$, $p = .07$
SCS–Mindful T1	None	None	None	None	None	None
SCS–Mindful T2	None	None	None	None	None	None
SCS–Mindful T3	None	None	None	**$r(9) = .75$, $p = .02$**	**$r(11) = .71$, $p = .01$**	**$r(11) = .80$, $p = .003$**
SCS–Self-Judg T1	None	None	None	None	$r(11) = -.58$, $p = .06$	**$r(13) = -.63$, $p = .02$**
SCS–Self-Judg T2	None	None	None	None	None	None
SCS–Self-Judg T3	None	None	None	None	None	None
SCS–Isolation T1	None	None	None	None	None	None
SCS–Isolation T2	None	None	None	None	None	None
SCS–Isolation T3	None	None	None	None	None	None

DLB Correlated With	**DLB Weeks 1–8 % (MBSR)**	**DLB Weeks 9–16 % (MBSR)**	**DLB Weeks 1–16 % (MBSR)**	**DLB Weeks 1–8 % (PMR)**	**DLB Weeks 9–16 % (PMR)**	**DLB Weeks 1–16 % (PMR)**
SCS–O-Ident T1	None	None	None	None	None	None
SCS–O-Ident T2	None	None	None	None	None	None
SCS–O-Ident T3	None	None	None	None	None	None
Awake Cort T1	None	None	None	None	None	None
Awake Cort T2	None	None	None	None	None	None
Awake Cort T3	None	None	None	$r(9) = -.59$, $p = .09$	None	None
DAC T1	None	None	None	None	None	None
DAC T2	None	None	None	None	None	None
DAC T3	None	None	None	None	None	None
CAR T1	None	None	None	None	None	None
CAR T2	None	None	None	None	None	None
CAR T3	None	**$r(9) = .70$, $p = .04$**	**$r(10) = .63$, $p = .05$**	None	None	None

GDS = Geriatric Depression Scale
PSS = Perceived Stress Scale
MAAS = Mindful Attention Awareness Scale
SCS = Self-Compassion Scale
SCS Pos Subscales = Self-Kindness, Common Humanity, Mindfulness
SCS Neg Subscales = Self-Judgment, Isolation, Over-Identified
Awake Cort = Awakening Cortisol
DAC = Daily Average Cortisol
CAR = Cortisol Awakening Response

T1 = Pre-Intervention
T2 = Post-Intervention
T3 = 8 Weeks Post-Intervention

REFERENCES

Alexander, C. N., Langer, E. J., Newman, R. I., Chandler, H. M., & Davies, J. L. (1989). Transcendental meditation, mindfulness, and longevity: An experimental study with the elderly. *Journal of Personality and Social Psychology, 57,* 950–964.

Agee, J. D., Danoff-Burg, S., & Grant, C. A. (2009). Comparing brief stress management courses in a community sample: Mindfulness skills and progressive muscle relaxation. *Explore, 5,* 104–109.

Baer, R. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology Science and Practice, 10,* 125–143.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13,* 27–45.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). Beck depression inventory (2nd ed.). San Antonio, TX: The Psychological Corporation.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry, 4,* 561–571.

Bernstein, D. A., & Borkovec, T. D. (1973). *Progressive relaxation training: A manual for the helping professions.* Champaign, IL: Research Press.

Blatt, S. J., D'Afflitti, J., & Quinlan, D. (1976). Experiences of depression in young adults. *Journal of Abnormal Psychology, 65,* 383–389.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84,* 822–848.

Brown, S. L., Smith, D. M., Schulz, R., Kabeto, M. U., Ubel, P. A., Poulin, M., . . . Langa, K. M. (2009). Caregiving behavior is associated with decreased mortality risk. *Psychological Science, 20,* 488–494.

Carlson, L. E., Speca, M., Faris, P., & Patel, K. D. (2007). One year pre-post intervention follow-up of psychological, immune, endocrine and blood pressure outcomes of Mindfulness-Based Stress Reduction (MBSR) in breast and prostate cancer outpatients. *Brain Behavior Immunity, 21,* 1038–1049.

Carlson, L. E., Speca, M., Patel, K. D., & Goodey, E. (2003). Mindfuless-Based Stress Reduction in relation to quality of life, mood, symptoms of stress, and immune parameters in breast and prostate cancer outpatients. *Psychosomatic Medicine, 65,* 571–581.

Chambers, R., Gullone, E., & Allen, N. B. (2009). Mindful emotion regulation: An integrative review. *Clinical Psychology Review, 29,* 560–572.

Chida, Y., & Steptoe, A. (2009). Cortisol awakening response and psychosocial factors: A systematic review and meta-analysis. *Biological Psychology, 80,* 265–278.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24,* 385–396.

Creswell, J. D., Irwin, M. R., Burklund, L. J., Lieberman, M. D., Arevalo, J. M. G., Ma, J., . . . Cole, S. W. (2012). Mindfulness-Based Stress Reduction training reduces

loneliness and pro-inflammatory gene expression in older adults: A small randomized controlled trial. *Brain, Behavior, and Immunity, 26,* 1095–1101.

Creswell, J. D., Myers, H. F., Cole, S. W., & Irwin, M. R. (2008). Mindfulness meditation training effects on CD4+ T lymphocytes in HIV-1 infected adults: A small randomized controlled trial. *Brain, Behavior, and Immunity, 23*, 184–188.

Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., . . . Sheridan, J. F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine, 65,* 564–570.

Davis, M., Eshelman, E. R., & McKay, M. (2008). Autogenics. In *The Relaxation & Stress Reduction Workbook* (6th ed., pp. 99–108). Oakland, CA: New Harbinger Publications, Inc.

Devilly, G. J., & Borkovec, T. D. (2000). Psychometric properties of the credibility/expectancy questionnaire. *Journal of Behavior Therapy and Experimental Psychiatry, 31,* 73–86.

De Vugt, M. E., Nicolson, N. A., Aalten, P., Lousberg, R., Jolle, J., & Verhey, F. R. J. (2005). Behavioral problems in dementia patients and salivary cortisol patterns in caregivers. *Journal of Neuropsychiatry and Clinical Neurosciences, 17,* 201–207.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49,* 71–75.

Doody, R. S., Stevens, J. C., Beck, C., Dubinsky, R. M., Kaye, J. A., Gwyther, L., . . . Cummings, J. L. (2001). Practice parameter: Management of dementia (an evidence-based review). *Neurology, 56,* 1154–1166.

Epstein-Lubow, G., McBee, L., Darling, E., Armey, M., & Miller, I. W. (2011). A pilot investigation of Mindfulness-Based Stress Reduction for caregivers of frail elderly. *Mindfulness, 2,* 95–102.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state": A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research, 12,* 189–198.

Franco, C., Sola, M. d. M., & Justo, E. (2010). Reducing psychological discomfort and overload in Alzheimer's family caregivers through a mindfulness meditation program. *Revista Española de Geriatría y Gerontología, 45,* 252–258.

Goldin, P. R., & Gross, J. J. (2010). Effects of Mindfulness-Based Stress Reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion, 10,* 83–91.

Grant, I., Adler, K. A., Patterson, T. L., Dimsdale, J. E., Ziegler, M. G., & Irwin, M. R. (2002). Health consequences of Alzheimer's caregiveing transitions: Effects of placement and bereavement. *Psychosomatic Medicine, 64,* 477–486.

Gross, C. R., Kreitzer, M. J., Reilly-Spong, M., Winbush, N. Y., Schomaker, E. K., & Thomas, W. (2009). Mindfulness meditation training to reduce symptom distress in transplant patients: Rationale, design, and experience with a recycled waitlist. *Clinical Trials, 6,* 76–89.

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-Based Stress Reduction and health benefits. A meta-analysis. *Journal of Psychosomatic Research, 57,* 35–43.

Hebert, R. S., Dang, Q., & Schulz, R. (2006). Preparedness for the death of a loved one and mental health in bereaved caregivers of patients with dementia: Findings from the REACH study. *Journal of Palliative Medicine, 9,* 683–693.

Helvaci, M. R., & Seyhanli, M. (2006). What a high prevalence of white coat hypertension in society! *Internal Medicine, 45,* 671–674.

Jain, M. S., Shapiro, S. L., Swanick, S., Roesch, S. C., Mills, P. J., Bell, I., & Schwartz, G. E. R. (2007). A randomized controlled trial of Mindfulness-Based Stress Reduction versus relaxation training: Effects of distress, positive states of mind, rumination, and distraction. *Annals of Behavioral Medicine, 33,* 11–21.

Jedrczak, A., Miller, D., & Antoniou, M. (1987). Transcendental meditation and health: An overview of experimental research and clinical experience. *Health Promotion International, 2,* 369–376.

Kabat-Zinn, J. (1982). An out-patient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry, 4,* 33–47.

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness.* New York: Delacorte.

Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of Behavioral Medicine, 8,* 163–190.

Kabat-Zinn, J., Lipworth, L., Burney, R., & Sellers, W. (1986). Four-year follow-up of a meditation-based program for the self-regulation of chronic pain: Treatment outcomes and compliance. *The Clinical Journal of Pain, 2,* 159–173.

Kabat-Zinn, J., Massion, A.O., Kristeller, J., Peterson, L.G., Fletcher, K. E., Pbert, L., . . . Santorelli, S. F. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *The American Journal of Psychiatry, 149,* 936–943.

Kabat-Zinn, J., Wheeler, E., Light, T., Skillings, A., Scharf, M. J., Cropley, T. G., . . . Bernhard, J. D. (1998). Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA). *Psychosomatic Medicine, 60,* 625–632.

Kaplan, K. H., Goldenberg, D. L., & Galvin-Nadeau, M. (1993). The impact of a meditation-based stress reduction program on fibromyalgia. *General Hospital Psychiatry, 15,* 284–289.

Lawton, M. P., & Brody, E. M. (1969). "Assessment living." *Gerontologist, 9*, 179–186.

Lee, R. M., & Robbins, S. B. (1995). Measuring belongingness: The social connectedness and the social assurance scales. *Journal of Counseling Psychology, 42,* 232–241.

Linden, W. (1994). Autogenic training: A narrative and quantitative review of clinical outcome. *Biofeedback and Self-Regulation, 19*, 227–264.

Lyness, J. M., Noel, T. K., Cox, C., King, D. A., Conwell, Y., & Caine, E. D. (1997). Screening for depression in elderly primary care patients. *Archives of Internal Medicine, 157,* 449–454.

MacCoon, D. G., Imel, Z. E., Rosenkranz, M. A., Sheftel, J. G., Weng, H. Y., Sullivan, J. C., . . . Lutz, A. (2011). The validation of an active control intervention for Mindfulness-Based Stress Reduction (MBSR). *Behaviour Research and Therapy, 50,* 3–12.

Marcus, M. T., Fine, M., Moeller, F. G., Khan, M. M., Pitts, K., Swank, P. R., & Liehr, P. (2003). Change in stress levels following Mindfulness-Based Stress Reduction in a therapeutic community. *Addictive Disorders & Their Treatment, 2,* 63–68.

Mausbach, B. T., Patterson, T. L., Rabinowitz, Y. G., Grant, I., & Schulz, R. (2007). Depression and distress predict time to cardiovascular disease in dementia caregivers. *Health Psychology, 26,* 539–544.

McBee, L. (2003). Mindfulness practice with the frail elderly and their caregivers: Changing the practitioner-patient relationship. *Topics in Geriatric Rehabilitation, 19,* 257–264.

Meuser, T., Marwit, S., & Sanders, S. (2004). Assessing grief in family caregivers. In: K. J. Doka (Ed.), *Living with grief: Alzheimer's disease.* (pp. 169–198). Washington, DC: Hospice Foundation of America.

Miller, J. J., Fletcher, K., & Kabat-Zinn, J. (1995). Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders. *General Hospital Psychiatry, 17,* 192–200.

Mitchell, A. M., Crane, P. A., & Kim, Y. (2008). Perceived stress in survivors of suicide: Psychometric properties of the perceived stress scale. *Research in Nursing and Health, 31*, 576–585.

Morone, N. E., Lynch, C. S., Greco, C. M., Tindle, H. A., & Weiner, D. K. (2008). "I felt like a new person." The effects of mindfulness meditation on older adults with chronic pain: Qualitative narrative analysis of diary entries. *The Journal of Pain, 9*, 841–848.

Neff, K. D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity, 2*, 223–250.

Noyes, B. B., Hill, R. D., Hicken, B. L., Luptak, M., Rupper, R., Dailey, N. K., & Bair, B. D. (2009). The role of grief in dementia caregiving. *American Journal of Alzheimer's Disease and Other Dementias, 25*, 9–17.

Nyklícek, I., Mommersteeg, P. M. C., Van Beugen, S., Ramakers, C., & Van Boxtel, G. J. (2013). Mindfulness-Based Stress Reduction and physiological activity during acute stress: A randomized controlled trial. *Health Psychology,* Advance online publication. doi: 10.1037/a0032200

Oken, B. S., Fonareva, I., Haas, M., Wahbeh, H., Lane, J. B., Zajdel, D., and Amen, A. (2010). Pilot controlled trial of mindfulness meditation and education for dementia caregivers. *The Journal of Alternative and Complementary Medicine, 16*, 1031–1038.

Perlman, D. M., Salomons, T. V., Davidson, R. J., & Lutz, A. (2010). Differential effects on pain intensity and unpleasantness of two meditation practices. *Emotion, 10*, 65–71.

Pomeroy, I. M., Clark, C. R., & Philp, I. (2001). The effectiveness of very short scales for depression screening in elderly medical patients. *International Journal of Geriatric Psychiatry, 16,* 321–326.

Pradhan, E. K., Baumgarten, M., Langenberg, P., Handwerger, B., Gilpin, A. K., Magyari, T., . . . Berman, B. M. (2007). Effect of Mindfulness-Based Stress Reduction in rheumatoid arthritis patients. *Arthritis Care & Research, 57,* 1134–1142.

Reibel, D. K., Greeson, J. M., Brainard, G. C., & Rosenzweig, S. (2001). Mindfulness-Based Stress Reduction and health-related quality of life in a heterogeneous patient population. *General Hospital Psychiatry, 23,* 183–192.

Rejeski, W. J. (2008). Mindfulness: Reconnecting the body and mind in geriatric medicine and gerontology. *The Gerontologist, 48,* 135–141.

Salovey, P., Mayer, J. D., Goldman, S. L., Turvey, C., & Palfai, T. P. (1995). Emotional attention, clarity, and repair: Exploring emotional intelligence using the Trait Meta-Mood Scale. In J. W. Pennebaker (Ed.), *Emotion, disclosure, & health* (pp. 125–154). Washington, DC: American Psychological Association.

Sanders, S., Ott, C. H., Kelber, S. T., & Noonan, P. (2007). The experience of high levels of grief in caregivers of persons with Alzheimer's disease and related dementia. *Death Studies, 32,* 495–523.

Sbarra, D. A., Law, R. W., Lee, L. A., & Mason, A. E. (2009). Marital dissolution and blood pressure reactivity: Evidence for the specificity of emotional intrusion-hyperarousal and task-rated emotional difficulty. *Psychosomatic Medicine, 71*, 532–540.

Schulz, R., & Beach, S. R. (1999). Caregiving as a risk factor for mortality: The caregiver health effects study. *Journal of the American Medical Association, 282,* 2215–2219.

Schulz, R., Belle, S. H., Czaja, S. J., Gitlin, L. N., Wisniewski, S. R., & Ory, M. G. (2003). Introduction to the special section on resources for enhancing Alzheimer's caregiver health (REACH). *Psychology and Aging, 18,* 357–360.

Schulz, R., Martire, L. M., & Klinger, J. N. (2005). Evidence-based caregiver interventions in geriatric psychiatry. *Psychiatric Clinics of North America, 28,* 1007–1038.

Shapiro, S. L., Bootzin, R. R., Figueredo, A. J., Lopez, A. M., & Schwartz, G. E. (2003). The efficacy of Mindfulness-Based Stress Reduction in the treatment of sleep disturbance in women with breast cancer: An exploratory study. *Journal of Psychosomatic Research, 54,* 85–91.

Shapiro, S. L., Oman, D., Thoresen, C. E., Plante, T. G., & Flinders, T. (2008). Cultivating mindfulness: Effects on well-being. *Journal of Clinical Psychology, 64,* 840–862.

Shapiro, S. L., Schwartz, G. E., & Bonner, G. (1998). Effects of Mindfulness-Based Stress Reduction on medical and premedical students. *Journal of Behavioral Medicine, 21,* 581–599.

Shaw, W. S., Patterson, T. L., Ziegler, M. G., Dimsdale, J. E., Semple, S. J., & Grant, I. (1999). Accelerated risk of hypertensive blood pressure recordings among Alzheimer caregivers. *Journal of Psychosomatic Research, 46,* 215–227.

Sheikh, J. I., & Yesavage, J. A. (1986). Geriatric Depression Scale (GDS): Recent findings and development of a shorter version. In *Clinical Gerontology: A Guide to Assessment and Intervention.* T. L. Brink (Ed.). New York: Howard Press.

Slaney, R. B., Mobley, M., Trippi, J., Ashby, J. S., & Johnson, D. P. (1996). The Almost Perfect Scale—Revised. Unpublished manuscript, The Pennsylvania State University.

Smith, A. (2004). Clinical uses of mindfulness training for older people. *Behavioural and Cognitive Psychotherapy, 32,* 423–430.

Smith, A., Graham, L., & Senthinathan, S. (2007). Mindfulness-Based Cognitive Therapy for recurring depression in older people: A qualitative study. *Aging & Mental Health, 11,* 346–357.

Son, J., Erno, A., Shea, D. G., Femia, E. E., Zarit, S. H., & Stephens, M. A. P. (2007). The caregiver stress process and health outcomes. *Journal of Aging and Health, 19,* 871–887.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *STAI Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Splevins, K., Smith, A., & Simpson, J. (2009). Do improvements in emotional distress correlate with becoming more mindful? A study of older adults. *Aging & Mental Health, 13*, 328–335.

Tacón, A. M., Caldera, Y. M., & Ronaghan, C. (2004). Mindfulness-Based Stress Reduction in women with breast cancer. *Families, Systems, & Health*, *22*, 193–203.

Venero, C., Díaz-Mardomingo, C., Pereda-Pérez, I., García-Herranz, S., Utrera, L., Valencia, A., & Peraita, H. (2013). Increased morning salivary cortisol levels in older adults with nonamnestic and multidomain mild cognitive impairment. *Psychoneuroendocrinology, 38,* 488–498.

Vogelzangs, N., Beekman, A. T. F., Milaneschi, Y., Bandinelli, S., Ferrucci, L. & Penninx, B. W. J. H. (2010). Urinary cortisol and six-year risk of all-cause and cardiovascular mortality. *Journal of Clinical Endocrinology and Metabolism, 95,* 4959–4964.

von Känel, R., Dimsdale, J. E., Patterson, T. L., & Grant, I. (2003). Association of negative life event stress with coagulation activity in elderly Alzheimer caregivers. *Psychomatic Medicine, 65,* 145–150.

von Känel, R., Mausbach, B. T., Dimsdale, J. E., Mills, P. J., Patterson, T. L., Ancoli-Israel, S., . . . Grant, I. (2010). Problem behavior of dementia patients predicts low-grade hypercoagulability in spousal caregivers. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences, 65A,* 1004–1011.

Waelde, L.C., Thompson, L., & Gallagher-Thompson, D. (2004). A pilot study of a yoga and meditation intervention for dementia caregiver stress. *Journal of Clinical Psychology, 60,* 677–687.

Weissbecker, I., Salmon, P., Studts, J. L., Floyd, A. R., Dedert, E. A., & Sephton, S. E. (2002). Mindfulness-Based Stress Reduction and sense of coherence among women with fibromyalgia. *Journal of Clinical Psychology in Medical Settings, 9,* 297–307.

World Health Organization, International Society of Hypertension Writing Group. (2003). 2003 World Health Organization (WHO)/International Society of Hypertension (ISH) statement on management of hypertension. *Journal of Hypertension, 21,* 1983–1982.

Yesavage, J. A., & Sheikh, J. I. (1986). 9/Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. *Clinical Gerontologist, 5,* 165–173.

Young, L. A., & Baime, M. J. (2010). Mindfulness-Based Stress Reduction: Effect on emotional distress in older adults. *Complementary Health Practice Review, 15,* 59–64.

Xiong, G. L., & Doraiswamy, P. M. (2009). Does meditation enhance cognition and brain plasticity? *Annals of the New York Academy of Sciences, 1172,* 63–69.