PILOT RCT OF MINDFULNESS-BASED STRESS REDUCTION (MBSR) VERSUS PROGRESSIVE MUSCLE RELAXATION (PMR) TO REDUCE SYMPTOMS OF DISTRESS AMONG ELDERLY DEMENTIA CAREGIVERS: RESULTS AT ONE YEAR POST-INTERVENTION

by

Rose Marie (Róisín) O'Donnell

A Dissertation Submitted to the Faculty of the

DEPARTMENT OF PSYCHOLOGY

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

In the Graduate College

THE UNIVERSITY OF ARIZONA

2017

THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the Dissertation Committee, we certify that we have read the dissertation prepared by Rose Marie (Róisín) O'Donnell, titled "Pilot RCT of Mindfulness-Based Stress Reduction (MBSR) Versus Progressive Muscle Relaxation (PMR) to Reduce Symptoms of Distress Among Elderly Dementia Caregivers: Results at One Year Post-Intervention" and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy.

_____ Date: 4/21/2017
Alfred W. Kaszniak, Ph.D.

_____ Date: 4/21/2017
John J. B. Allen, Ph.D.

_____ Date: 4/21/2017
David A. Sbarra, Ph.D.

_____ Date: 4/21/2017
Mary-Frances O'Connor, Ph.D.

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copies of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

_____ Date: 4/21/2017
Dissertation Director: Alfred W. Kaszniak

_____ Date: 4/21/2017
Dissertation Co-Director: David A. Sbarra

STATEMENT BY AUTHOR

This dissertation has been submitted in partial fulfillment of the requirements for an advanced degree at the University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the Library.

SIGNED: Rose Marie (Róisín) Minna O'Donnell

ACKNOWLEDGMENTS

I would like to express my deep appreciation to the many people who contributed to the project and who guided and supported and encouraged me to the end. First of all, I want to thank the Mind and Life Summer Research Institute for funding the study via the Francisco J. Varela award. Without this funding, I would not have been able to pay for advertising and other recruitment strategies, to provide a stipend to the participants, to offer professional caregiver assistance when requested, to purchase intervention supplies and equipment, or to analyze salivary cortisol, all of which were critical to the aims of the study.

I am very grateful to John J. B. Allen, who first provided the impetus and guidance for the study in his Psychophysiology class, and to Alfred W. Kaszniak, David A. Sbarra, and J. David Creswell, who helped shape the research project into what it eventually became. I feel very fortunate to have had such an esteemed, kind and generous committee, consisting of Alfred W. Kaszniak, John J. B. Allen, Mary-Frances O'Connor, and David A. Sbarra, and want to express my gratitude to the committee for its careful consideration of the dissertation. I especially want to thank my advisor, Alfred W. Kaszniak, who was unending in his patience and understanding, and brilliant in his insights, suggestions and editorial comments.

I am also most grateful to L'Don Sawyer from Tucson Medical Center, Tim Carmichael from La Posada Retirement Community, and Ellen March at Casa Community Services, for providing wonderful classroom space to the project free of charge for the intervention training programs. I especially want to thank Marcia Wiener, Cynthia A. Holmes, Terri Waldman and Jessie V. Pergrin, whose faith in the project led to the recruitment of participants into the study. I am deeply grateful to the twenty-eight participants of the study, who agreed to take this journey with me for almost two years and who taught me more about caregiving than I could ever learn from books or courses.

I will be forever grateful to study coordinator Sara Ziebell, whose consistent managerial supervision of the project and the research assistants was vital to the smooth operation of the project over the entire two-year period. I want to thank each and every one of the small army of undergraduate researchers who facilitated the daily and weekly work associated with the participants and the data: Krista Vance, Kara Casanova, Mark Ruoff, Jenny McCullough, Jennifer Donajkowski, Jaclyn Harper, Hiba Khan, Marium Tufail, Tijana Nikolich-Zugich, Julie Millhollon, Kayla Iwahashi, Kelly Young, and Zachary Conley.

I want to acknowledge the wonderful and important work of Jon Kabat-Zinn and the staff at the Center for Mindfulness in Medicine, Health Care and Society, University of Massachusetts Medical Center, and the Mindfulness-Based Stress Reduction (MBSR) program, that I was privileged to learn and teach. I want to thank Jon Kabat-Zinn, Saki Santorelli, Florence Meleo-Meyer and Melissa Blacker for invaluable instruction, guidance, supervision and support.

Finally, and most importantly, I want to thank my best friend, life partner and darling husband, William H. Leyva. Bill encouraged me to return to college to finish an undergraduate degree and continued to be supportive and enthusiastic when I expressed a desire to undertake a doctoral degree in psychology. Without Bill, his constant love, patience and occasional impatience, none of this work would ever have happened.

DEDICATION

I would like to dedicate this Doctoral Dissertation to all families with a member who is diagnosed with a degenerative neurocognitive disorder. In particular, I want to dedicate the dissertation 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 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 made available to all families and caregivers who seek it, so that the process of caregiving becomes a little less burdensome, a little less heartbreaking, and hopefully less exhausting, and affords an alternative perspective to the role of caregiving that includes self-care and an opportunity for a rewarding and meaningful journey with their family member.

TABLE OF CONTENTS

TABLE OF CONTENTS—*Continued*

TABLE OF CONTENTS—*Continued*

LIST OF TABLES

LIST OF TABLES—*Continued*

LIST OF FIGURES

LIST OF FIGURES—*Continued*

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 an 8-week stress-reduction program, Mindfulness-Based Stress Reduction (MBSR), and compared it to a similarly structured, alternative behavioral intervention, Progressive Muscle Relaxation (PMR), to determine if MBSR was as effective or more effective than PMR at reducing subjective burden, symptoms of depression, perceived loneliness or perceived stress among middle-aged and older family caregivers of persons with dementia and other neurocognitive disorders. Twenty-eight participants were randomly assigned to either MBSR or PMR. Self-report and biological measures were collected on five occasions: At the beginning and end of intervention training, and at 8 weeks, 6 months and 1 year following the end of intervention training. In addition to a packet of self-report questionnaires and home-collected salivary cortisol, a laboratory controlled emotional stress test was designed to elicit an emotionally stressful response relevant to caregivers' experience of caregiving, and facilitate the measurement of stress-related changes in systolic blood pressure and cortisol reactivity. At 1 year post-intervention, the PMR group showed a significantly greater reduction in perceived stress and disruptive patient behaviors. A reduction in emotional reactivity to patient problem behaviors approached significance (p = .08) at 1 year post-intervention for the PMR group. The MBSR group showed significantly greater reductions in self-reported symptoms of depression and perceived

isolation from pre- to post-intervention, and those changes remained significant at 8 weeks post-intervention. However, by 1 year post-intervention, interaction effects were non-significant as both groups showed similar decreases in symptoms of depression and perceived isolation. Both groups showed similar decreases in diurnal cortisol, cortisol awakening response, and daily average cortisol (but not laboratory cortisol) from pre- to post-intervention and further decreases at 8 weeks post-intervention, and showed similar reductions in magnitude of change by 1 year post-intervention. This pattern was similar for both groups with systolic blood pressure, showing decreases from pre- to post-intervention, additional decreases at 8 weeks post-intervention, and returning towards baseline by 1 year post-intervention. Both groups also reported similar increases in levels of dispositional mindfulness and self-compassion and similar improvement in overall sleep quality that was sustained at 1 year post-intervention. No changes were seen for perceived burden or loneliness. Significant correlations with amount of daily practice of the instructed stress-reduction approaches were observed for several of the dependent measures from pre- to post-intervention and 8 weeks post-intervention. From pre-intervention to 1 year post-intervention, an overall pattern emerged, where both groups showed similar improvements from pre- to post-intervention, and additional improvements at 8 weeks post-intervention, but displayed a curvilinear reduction in improvements—with some exceptions—and a return towards baseline at 6 months and 1 year post-intervention. In general, reductions in the magnitude of changes observed by 1 year post-intervention remained below baseline levels. Results suggest that both MBSR and relaxation-based interventions may be differentially effective in reducing psychological and physiological indices of chronic stress among older caregivers of

relatives with neurocognitive disorders. However, further research, employing wait-list control participants, will be necessary for unambiguous interpretation of the present results.

CHAPTER 1

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 dementia, the burden and resulting stress is greatly increased. Elderly spousal caregivers of persons suffering from dementia are at high risk for depression and decreased sense of self-efficacy and general subjective well-being. Caregivers are also at greater risk for developing health problems, particularly hypertension and cardiovascular disease. The extent to which caregiving can impact physical health was shown in a study by Schulz and Beach (1999), who found that elderly spousal caregivers who are living with the care recipient and who reported experiencing caregiver strain were 63 percent more likely to die over a 4-year period than a comparable sample of non-caregivers. In addition, family caregivers of persons with dementia suffer from loss and grief, which is experienced during the decline of the patient as well as after the patient's death (Meuser, Marwit, & Sanders, 2004).

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. One of the most ambitious interventions 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 multiple different interventions and to evaluate the pooled effects of all interventions combined. Among the 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 burden and depressive symptoms (Gitlin et al., 2003).

Mindfulness-Based Stress Reduction (MBSR) is an 8-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 School in 1979 (Kabat-Zinn, 1990). Past and ongoing research has consistently shown "clinically relevant reductions in medical and psychological symptoms" (Center for Mindfulness, n.d.) across a wide range of medical diagnoses, including many different chronic pain conditions, and medical patients with a secondary diagnosis of anxiety disorders, among others. The benefits of MBSR have been maintained in these cases for up to four years after training (Kabat-Zinn, Lipworth, Burney, & Sellers, 1986; Kabat-Zinn et al., 1992; Miller, Fletcher, & Kabat-Zinn, 1995).

To date, there are very few published empirical studies that evaluate the effectiveness of MBSR among older family caregivers of persons with dementia. The present study aims to ascertain whether MBSR is an effective intervention for a population of elderly family caregivers of persons with dementia. The present study compared a group of elderly family caregivers who participated in an 8-week MBSR training with a randomly assigned group of caregivers who participated in a similarly structured, 8-week, behavioral intervention based on well-established, evidence-based stress-reduction and relaxation techniques.

Self-report and biological measures were collected five times: At the beginning and end of the intervention training, and at 8 weeks, 6 months and 1 year following the end of the interventions. Self-report measures assessed perceived levels of stress, perceived levels of caregiver burden, depressive symptoms, sleep quality, loneliness, and emotional reactivity to care recipient problem behaviors. Other self-report measures assessed levels of perceived mindfulness and self-compassion. Saliva samples were collected to assess levels of cortisol diurnally and immediately before and after a laboratory-controlled stressor. Blood pressure was also measured several times during the laboratory-controlled stressor at each assessment period. Primary outcome measures were separate analyses of within- and between-group changes from baseline to post-intervention and 8-week, 6-month and 1-year follow-ups in perceived levels of stress, depression, loneliness, mindfulness, and self-compassion. Secondary outcome measures analyzed within- and between-group changes in self-reported levels of sleep quality, perceived caregiver burden, and emotional reactivity to patient problem behaviors, as well as changes in systolic blood pressure and salivary cortisol. The specific questions this study attempted to answer are:

1. Does MBSR decrease perceived levels of stress, loneliness and symptoms of depression to a greater extent when compared to PMR?
2. Does MBSR increase perceived levels of mindfulness and self-compassion to a greater extent when compared to PMR?
3. Are changes in primary outcome measures sustained at 8 weeks, 6 months and 1 year post-intervention across all groups and to a greater extent by MBSR when compared to PMR?

Secondary outcome questions included:

4. Does MBSR improve perceived levels of sleep quality to a greater extent when compared to PMR?
5. Does MBSR decrease perceived levels of caregiver burden and emotional reactivity to patient problem behaviors to a greater extent when compared to PMR?
6. Does MBSR decrease resting levels of systolic blood pressure and blood pressure in response to a stressor to a greater extent when compared to PMR?
7. Does MBSR decrease cortisol levels upon awakening, diurnally, or as a result of a stressor to a greater extent when compared to PMR?
8. Are changes in physiological, biological and self-report measures sustained at 8 weeks, 6 months and 1 year following post-intervention across all groups, and to a greater extent for the MBSR group?

The study hypothesized that from pre- to post-intervention for both groups, and to a greater extent for the MBSR group:

a) perceived levels of stress, loneliness and symptoms of depression would decrease; and

b) perceived levels of mindfulness and self-compassion would increase.

The study further hypothesized that from pre- to post-intervention for both groups, and to a greater extent for the MBSR group:

c) perceived levels of sleep quality would improve;

d) perceived levels of caregiver burden and emotional reactivity to patient problem behaviors would decrease;

e) resting systolic blood pressure and systolic blood pressure in response to a stressor would decrease;

f) cortisol levels upon awakening, diurnally, and as a result of a stressor would decrease; and

g) changes from pre- to post-intervention would be sustained at 8 weeks, 6 months, and 1 year following the end of intervention training.

Background and Significance

A comprehensive, evidence-based review of management practices for dementia recommends that in the area of caregiver support, research is needed to develop ways to match caregiver interventions to the specific needs of caregivers, and to identify the support group processes that contribute to both positive and negative outcomes (Doody et al., 2001). Meditative and mindfulness-based practices would appear to hold promise as an avenue of intervention and support that caregivers could utilize to enhance coping with the unique stresses and burdens of their individual caregiving. However, the literature on effects of meditative or mindfulness practices on dementia caregivers is scant though encouraging. The following section will begin with a brief review of the health consequences of caregiving for persons with dementia. This will be followed by brief descriptions of the proposed physiological measures and their relevance for this study. The section will conclude with a brief review of research on MBSR and its relevance to the physiological measures and present population of interest.

The Health Consequences of Caregiving for Persons with Dementia

There is consistent evidence that caring for an individual with dementia is burdensome and stressful to most family members and contributes to elevated rates of depression, anxiety and other distress (Schulz, Martire, & Klinger, 2005; Schulz & Beach, 1999). In addition, research also suggests that the combination of loss, prolonged distress, physical demands of caregiving, and caregivers' own biological vulnerabilities may compromise their physiologic functioning and increase their risk for physical health problems (Son et al., 2007; Schulz, Martire, & Klinger, 2005). Many of these symptoms relate to patient problem behaviors. A combination of increased depressive symptoms and the distress associated with reactions to patient problem behaviors have been found to be significant predictors of time to cardiovascular disease (CVD) (Mausbach, Patterson, Rabinowitz, Grant, & Schulz, 2007). A study of caregivers of persons with Alzheimer's disease (AD) revealed that stressors superimposed on top of the chronic stress of Alzheimer caregiving may elicit excessive blood clotting, as indexed by the procoagulant measure fibrin D-dimer, that could contribute to the excess coronary disease rate and increased overall mortality that exist with this population (von Känel, Dimsdale, Patterson, & Grant, 2003; von Känel et al., 2001). This result was replicated without the additional life stressors and when compared with non-caregivers (von Känel et al., 2005). Higher levels of both objective and subjective stressors (patient problem behaviors and perceived overload, respectively) were 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). These and many other findings demonstrate caregivers' vulnerability to the effects of stress and the critical need for interventions that

can alleviate stress. However, despite these and other studies that link caregiving behavior with increased risk for psychiatric morbidity and mortality, Brown and colleagues (2009) showed that spending at least 14 hours per week providing care to an elderly spouse predicted *decreased* mortality for the caregiver. This result suggests that health risks for elderly caregivers may not be directly due to providing active help to the care recipient and indicates a need to further explore the variety of caregiving experiences and influences as possible mediators or moderators on the risk of mortality.

Physiological Measures Associated with Caregiver Stress

Blood Pressure and Hypertension

Blood pressure is the force applied to the walls of the arteries when the heart pumps blood. Blood pressure generally refers to arterial pressure, which is the pressure in the larger arteries that take blood away from the heart. Blood pressure is measured in millimeters of mercury (mm Hg) by a sphygmomanometer, which typically uses the height of a column of mercury to quantify the pressure. Modern vascular pressure devices may not use mercury but values are still reported in mm Hg. Two values are usually reported: The first or top value is systolic pressure, representing the force exerted when the heart contracts; the second or bottom value, is diastolic pressure, representing the pressure when the heart is at rest. Normal arterial pressure for an adult is less than 120 mm Hg of systolic pressure and less than 80 mm Hg of diastolic pressure, usually written as 120/80. There is a distribution of variation around this average. High blood pressure, also known as hypertension, is defined in an adult as a blood pressure greater than or equal to 140/90 and is considered to be abnormal. High blood pressure directly increases

the risk of coronary heart disease (CHD), which can lead to heart attack (Chobanian et al., 2003). Hypertension also increases the risk for stroke, especially when other risk factors are prevalent (Chobanian et al., 2003). According to Chobanian et al., "The relationship between BP and risk of CVD events is continuous, consistent, and independent of other risk factors. The higher the BP, the greater is the chance of heart attack, HF [heart failure], stroke, and kidney diseases" (p. 1211).

Hypertension has no symptoms and is known as the "silent killer." The prevalence and serious consequences of high blood pressure explain why blood pressure measurement is fundamental to routine physician visits and is taken at regular intervals during hospitalizations. The cause of high blood pressure remains unknown for 90–95 percent of cases and is common among the elderly (Chobanian et al., 2003). Chobanian and colleagues state "The prevalence of hypertension increases with advancing age to the point where more than half of people aged 60 to 69 years old and approximately three-fourths of those aged 70 years and older are affected" (p. 1209). Research has linked hypertension with obesity, poor diet and high salt intake, lack of physical activity and excess alcohol intake (Chobanian et al., 2003).

Measures of arterial pressure are not static, but undergo natural variations from one heartbeat to another and throughout the day. Blood pressure changes in response to stress, nutritional factors, drugs, or disease. It is believed that a significant number of people diagnosed with hypertension may not have consistently elevated blood pressure, but rather elevations that are reactive to medical examinations. This type of reactive blood pressure response is called "white coat hypertension." In one Turkish study of 438 consecutive patients, where blood pressure measured by clinicians was compared to a 10-

day twice daily home blood pressure measurement as well as a 24-hour ambulatory blood pressure measurement, it was shown that 43 percent had white coat hypertension (Helvaci & Seyhanli, 2006). In a prospective study of 796 men, blood pressure reactivity to acute psychological stress predicted high blood pressure ten years later, though initial baseline screening gave the strongest predictor (Carroll et al., 2001). In a unique study by King, Oka and Young (1994) that measured the hemodynamic and psychological responses of five women identified as family caregivers who also worked outside the home, ambulatory blood pressure levels in the work setting and in the clinic were comparable with those of non-caregivers. However, in contrast to non-caregivers, who showed the expected decrease in blood pressure level upon leaving the work setting (p values < .03), caregivers demonstrated a significant increase in systolic blood pressure levels following work when they were in the presence of the care recipient ($p < .0002$) (King et al., 1994). A study of gender differences in cardiovascular response among dementia caregivers showed that female caregivers experience greater blood pressure reactivity to caregiving-related stress than do male caregivers (Atienza, Henderson, Wilcox, & King, 2001).

Cortisol and Stress

Salivary cortisol is a relatively recent and non-invasive biological marker used to measure occupational and other stress (Koh & Koh, 2007). Salivary cortisol indicates activation of the hypothalamic-pituitary-adrenal (HPA) axis and is associated with chronic stress. Because saliva collection is non-invasive, it is a preferred method of researching stress biomarkers since its collection is unlikely to cause distress, which could bias the results. In addition, salivary cortisol correlates better with serum

adrenocorticotrophin (with a delay of 15 minutes) than with serum cortisol (derived from blood), and adrenocorticotrophin is believed to more accurately reflect the secretory activity in the HPA axis (Koh & Koh, 2007; Lundberg, 2004). Finally, saliva can provide a real-time biomarker as there is no storage of the fluid before sampling.

Cortisol levels change throughout the day, showing a marked circadian rhythm, and these changes are captured in saliva. The typical pattern of cortisol release consists of low levels of cortisol during slow-wave nocturnal sleep followed by a steady increase in levels during late sleep and a peak level achieved approximately 30–40 minutes after awakening (de Vugt et al., 2005). Cortisol levels decline quickly afterwards and gradually continue decreasing throughout the day. Peak increases in cortisol levels are most likely to be seen approximately 21–40 minutes after onset of an acute stressor (Dickerson & Kemeny, 2004).

Although responses to stressors have been and continue to be important for survival and are therefore beneficial, modern society's stressors are more psychological and psychosocial in nature and tend to have damaging effects on health. Bruce McEwen (1998) proposed the Allostatic Load Model to explain why stress responses are not always beneficial. The term 'allostasis' describes the ability of various physiological systems to adapt to changes and demands in one's environment. McEwen proposed that rapid activation is necessary to effectively deal with those changes, and that rapid shutting down of those systems is also necessary for recuperation. Repeated and sustained activations of the allostatic systems without recovery periods will result in overexposure to stress hormones that, along with other physiological changes, increase

the risk of various health problems. An inadequate activation (perhaps through exhaustion) also increases the risk of health problems.

According to the Allostatic Load Model, family caregivers of persons with dementia who experience strain in their role as caregiver are not allowed the opportunity to rest and recuperate due to the constant caring required, and are likely to suffer from chronic stress. Son et al., (2007) showed that primary caregivers of elderly relatives with dementia reported feelings of overload (subjective stress) and care recipient behavior problems (objective stress), and that higher levels of both subjective and objective stressors were associated with poorer self-reported health, more negative health behaviors and greater use of health care services.

Although it is mostly the case that increased levels of cortisol indicate increased levels of physiological stress, chronic stress can lead to either increases or decreases in overall cortisol levels. Varadhan and colleagues (2008) found higher levels of cortisol throughout the day but lower (blunted) diurnal variation of cortisol among frail older women when compared with non-frail older women. Elderly dementia caregivers were shown to have higher cortisol levels upon awakening, smaller increases in cortisol after awakening, and no differences in diurnal levels when compared to non-caregivers (de Vugt et al., 2005). Therefore, several saliva samples taken throughout the day, and different measures, are required to interpret the results. A 1-year follow-up study of MBSR among 59 breast cancer and prostate cancer patients showed continuous decreases in subjective stress symptoms and mean diurnal salivary cortisol values consistent with lower perceived levels of stress at all time periods (Carlson, Speca, Faris, & Patel, (2007).

Mindfulness-Based Stress Reduction (MBSR)

MBSR is a group-based intervention with roots in meditation techniques associated with Buddhist practice. MBSR combines meditation and other techniques to promote mindfulness, which is described as a process of bringing attention to moment-by-moment experience. Early research on MBSR showed reductions in anxiety and depressive symptoms as well as pain level in chronic pain conditions (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985; and Kabat-Zinn, Lipworth, Burney, & Sellers, 1986). Other studies included research on anxiety disorders (Miller, Fletcher, & Kabat-Zinn, 1995), the treatment of psoriasis (Kabat-Zinn, Relman, Riley, Hosmer, & Dossey, 2001), prostate cancer (Saxe et al., 2001), immune function (Davidson et al., 2003), hot flashes (Carmody, Crawford, & Churchill, 2006), breast cancer (Carlson, Speca, Faris, & Patel, 2007), and HIV (Creswell, Myers, Cole, & Irwin, 2009), among others, and consistently found reductions in symptoms of depression, anxiety and stress (both perceived and physiological), increases in well-being, self-efficacy, empathy, and self-compassion, and speedier time to recovery or stability. Research on MBSR techniques of meditation has shown reductions in heart rate, blood pressure, metabolism and vascular blood flow among breast and prostate cancer outpatients (Carlson, Speca, Faris, & Patel, 2007). The MBSR program has also shown reductions in perceived stress, depression, and anxiety symptoms in the treatment of substance addiction in a residential recovery treatment program (Marcus et al., 2003). A recent meta-analysis of research on the effects of meditation programs (including MBSR) on psychological stress and

well-being found that mindfulness meditation programs have moderate evidence of improved anxiety (effect size, 0.38 at 8 weeks and 0.22 at 3–6 months), depression (0.30 at 8 weeks and 0.23 at 3–6 months), and pain (0.33) (Goyal et al., 2014). The review also found low evidence of improved stress/distress and mental health-related quality of life. In addition, the authors found low evidence of no effect or insufficient evidence of any effect of meditation programs on positive mood, attention, substance use, eating habits, sleep, and weight. They also found no evidence that meditation programs were better than any active treatment (i.e., drugs, exercise, and other behavioral therapies). Finally, there was low evidence of no effect or insufficient evidence that mantra meditation programs had an effect on any of the psychological stress and well-being outcomes examined.

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 compared three groups (transcendental meditation (TM), mindfulness training in active distinction making (MF) and mental relaxation (MR)) versus a wait-list control group among 73 elders (mean age = 81) living in eight nursing homes (Alexander, Langer, Newman, Chandler, & Davies, 1989). The mindfulness training program provided a "guided attention technique" involving a structured

word-production task and an unstructured creative mental activity task. It should be noted that the mindfulness training provided in this study differs considerably from that of more recent studies examining MBSR. The authors hypothesized that TM and mindfulness training would reverse age-related decline and enhance longevity in comparison to mental relaxation (considered low mindfulness) and no treatment. After three years, survival rate was 100 percent for the TM group, 87.5 percent for the mindfulness training group, and significantly lower for the mental relaxation (65 percent), no treatment (77.3 percent) and remaining nursing home resident (62.6 percent) groups. TM and mindfulness training groups also had significantly lower systolic blood pressure post-intervention, higher mental health improvement ratings after 18 months, and significantly better cognitive test results when compared with relaxation and no treatment groups. Interestingly, there were no group differences on measures of trait anxiety or depression.

More recent data on mindfulness training programs for elders are sparse. Qualitative assessments of potential benefits are few in number though 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). Twenty-two older adults (mean age = 65) who

participated in an 8-week MBCT program with pre-post design 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).

In another pre-post design, beneficial effects of mindfulness meditation on pain, attention, sleep, and a sense of well-being were reported via narrative analysis of diary entries of older adults (mean age = 74) with chronic low back pain (Morone, Lynch, Greco, Tindle, & Weiner, 2008). Retrospective data analysis based on pre-post completion of the Profile of Mood States–Short Form (POMS-SF) of 141 older adults (mean age = 65) who completed minimally modified MBSR training found a greater than 50 percent reduction in the number of elders reporting clinically significant depression and anxiety (Young & Baime, 2010). A pre-post longitudinal qualitative evaluation of MBCT to prevent relapse of recurrent depression among 30 elders (mean age = 70) found "MBCT promising as a cost-effective addition to clinicians' repertoire for addressing depression in old age" (p. 346, 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 1 year post-intervention, 61 percent endorsed this statement. The Beck Depression Inventory II (BDI-II), administered to screen out severely depressed individuals and to track levels of depression during and afterwards showed a slight decrease in mean scores from pre- to post-intervention ($M = 10.37$, $n = 30$, $M = 9.14$, $n = 29$) and, encouragingly, a further decrease at 1-year follow-up ($M = 7.84$, $n = 25$).

More recently, a few studies of MBSR among older adults have been randomized controlled trials. A randomized controlled pilot study of MBSR among community-dwelling older adults (mean age = 65) found reductions in self-reported loneliness and, in addition, down-regulated pro-inflammatory NF-kB-related gene expression in circulating leukocytes when compared to a wait-list control group (Creswell et al., 2012). A randomized controlled trial of MBSR versus a wait-list control group among 200 community-dwelling older adults (mean age ~ 72) revealed several findings. Moynihan et al. (2013) found small but significant improvements in executive function, mindfulness and sustained left frontal alpha asymmetry, but unexpectedly lower antibody responses after antigen challenge. A smaller group from the same cohort showed improvements in positive affect with lower depressive symptom severity (Gallegos, Hoerger, Talbot, Moynihan, & Duberstein, 2013), and that MBSR mindfulness practices, in particular the gentle yoga component of MBSR, was shown to benefit physiologic function through a positive association with IGF-1 levels (Gallegos et al., 2013). Finally, a randomized controlled trial of 282 community-dwelling older adults with chronic low back pain received an 8-week mind-body intervention program followed by 6 monthly sessions that was based on MBSR. The mind-body intervention was compared with a health education program that was modeled on the "10 Keys" to Healthy Aging (Morone et al., 2016). Results showed improvements in short-term physical functioning, which were not sustained at 6 months, and, in addition, improvements in long-term current pain, and most severe pain.

Mindfulness-based interventions among 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. Anecdotal reports for nursing home residents include feeling less sadness and less physical pain, reconnecting with one's spiritual heritage, with the greatest benefit attributed by participants to the shared group experience (McBee, 2003). A pre-post design pilot study that examined the effects of yoga-meditation training with 12 female dementia caregivers (mean age = 56) showed significant reductions in depression and anxiety and improvements in perceived self-efficacy (Waelde, Thompson, & Gallagher-Thompson, 2004). Similar decreases in self-reported symptoms of depression, burden and stress, with further decreases in stress and burden seen at 1-month follow-up were also reported in a pre-post design among nine female caregivers (mean age = 56) with a modified version of MBSR (Epstein-Lubow, McBee, Darling, Armey, & Miller, 2011). However, a quasi-experimental study found that similar decreases in perceived burden when compared to a control group were not maintained four months post-intervention (Franco, Sola, & Justo, 2010). An 8-week mindfulness training program, tailored towards caregivers and patients with early-stage cognitive decline, showed increased quality-of-life ratings, decreased symptoms of depression, and improved subjective sleep quality (Paller et al., 2015). Twenty dementia caregivers that included older individuals (mean age = 61) who participated in a modified MBSR program with pre-post design showed significant improvements in psychological resilience (Ho et al., 2016). These improvements were seen among some but not all caregivers. In addition, gene expression profiles identified predictive biomarkers whose expression is associated with the likelihood of caregivers to benefit from MBSR training.

Biomarkers whose expression was associated with MBSR-related psychological benefits were also identified.

Unfortunately, the above-described caregiver studies have several methodological shortcomings. These include small numbers of participants, no active or wait-list control groups as comparison, and no use of randomized controlled research designs. A literature review of mindfulness-based interventions for all caregivers by Jaffray, Bridgman, Stephens and Skinner (2016) identified a total of 13 studies in the previous five years, seven focused only on dementia caregivers. Of those seven, only two were randomized controlled trials involving MBSR (Whitebird et al., 2012, and O'Donnell, 2013). The review found that the effects of mindfulness-based interventions for caregivers were not as robust as for those in the wider mindfulness intervention literature. However, the authors concluded that in the setting of palliative caregiving, the application of mindfulness-based interventions would be feasible and likely beneficial. They also suggested that the reduced magnitude of effect might be due to a lack of sensitive outcome measures and recommended more qualitative research to explore outcomes identified by caregivers. The Whitebird et al. (2012) study is a randomized, controlled trial of MBSR among dementia caregivers that included older individuals (mean age = 57). Results showed that MBSR was more effective than an active control at reducing symptoms of depression and stress and increasing overall mental health. In this study, a total of 78 participants, mostly women caring for a parent with dementia, were recruited over a three-year period and were randomly assigned to either MBSR or a community caregiver education and support intervention that was matched for time and attention. In addition to finding decreased levels of stress and depression and increased

overall mental health for the MBSR group, both groups showed improvements in perceived levels of caregiver mental health, anxiety, burden and social support. A randomized controlled pilot trial of a mindfulness meditation program adapted from Mindfulness-Based Cognitive Therapy (MBCT) was compared with an education class based on Powerful Tools for Caregivers and a respite-only control group for 31 caregivers (mean age = 64) of relatives with dementia (Oken et al., 2010). Results showed a significantly greater decrease in self-reported stress from pre- to post-intervention for both active intervention groups in comparison to the respite-only control group. Finally, a more recent randomized controlled trial of an adapted MBSR program among dementia caregivers that included older individuals (mean age = 61) was compared with a similarly structured active control condition based on social support (Brown, Coogle, & Wegelin, 2016). Results at post-intervention revealed significant decreases in perceived stress and mood disturbance for the MBSR participants relative to the active control participants. However, at three months after the end of training, both groups showed similar stress reduction improvements. Salivary diurnal cortisol levels remained unchanged from pre- to post-intervention and at three months post-intervention.

The Present Study

Evidence exists for the psychological and physiological effects of stress and burden on caregivers of persons with dementia. Evidence also exists regarding the effectiveness of MBSR as a stress-reduction tool. To date, few empirical studies have been published that evaluate the effectiveness of MBSR among older family caregivers of persons with dementia or other neurocognitive disorders. The motivation to conduct this

study was to directly address this gap in the literature. Applying self-report and biological measures would help to more comprehensively assess the construct of stress as it relates to caregiving. In addition, a laboratory-controlled emotional stress test was created as an analogue to facilitate the understanding of caregivers' physiological responses when they think about difficult caregiving experiences with their care recipients. The Caregiver-Specific Mental Activation Task (CMAT) was modeled after the Divorce-Specific Mental Activation Task (DMAT) created by Sbarra, Law, Lee, and Mason (2009). The CMAT was designed to elicit an emotionally stressful response relevant to caregivers' experience of caregiving, and facilitate the measurement of stress-related changes in systolic blood pressure and cortisol reactivity, among other measurements, from baseline to during and after the CMAT.

Preliminary Studies

The Neuropsychology, Emotion, and Meditation Laboratory at the University of Arizona conducted a self-report survey assessing emotion regulation strategy among caregivers of persons with dementia. The survey included questionnaires assessing perceived symptoms of depression, perceived levels of caregiver burden, and quality-of-life measures that included perceived health status, perceived social support, levels of activities, and subjective sleep quality. Preliminary results confirmed significantly greater symptoms of depression, caregiver burden and poorer perceived health when compared with matched non-caregivers (O'Donnell, Kaszniak, & Menchola, 2008). Research on middle-aged and older long-term Zen and mindfulness meditators showed greater emotional clarity for meditators than non-meditators, and showed that

meditators reporting higher clarity had reduced self-reported and physiological (skin conductance response) arousal in response to very briefly presented and visually masked emotional scenes (Nielsen & Kaszniak, 2006). The laboratory has also used physiological measures in a study of depression among bereaved individuals and found that bereaved participants showed significantly higher heart rate than either depressed or control participants (O'Connor, Allen, & Kaszniak, 2002). A later study that examined the physiological and self-report effects of written emotional disclosure on bereaved participants resulted in both the bereaved and control writing conditions showing improvements in perceived levels of psychological health, but the bereaved participants with the highest RSA benefited most from the written disclosure (O'Connor, Allen, & Kaszniak, 2005). Finally, analyses of a selected number of measures at pre-intervention, post-intervention, and 8 weeks post-intervention from the present study were encouraging (O'Donnell, Kaszniak, Ziebell, & Menchola, 2011; O'Donnell, 2013). For the primary outcome measure of depression symptoms, results suggested that MBSR is advantageous for elderly dementia caregivers, and for the perceived stress measure, there were significant pre- to post-training decreases seen for both interventions. Both interventions also appeared to increase levels of dispositional mindfulness and self-compassion, and to decrease diurnal cortisol levels and systolic blood pressure.

CHAPTER 2

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 or informal 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 percent 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, 6 were not eligible and 14 declined to participate. A total of 28 participants (26 females, 2 males) began intervention training. See Figure 2.1 for details of participant retention and attrition throughout the study. Participants ranged in age from 66 to 88 years (mean age = 72, SD = 6.7). Of those 28 participants, 24 had cared for or were caring for their spouses (two participants had lost their spouses to death three months prior to joining the study), and four cared for a parent (mean age of care recipient = 78, SD = 7.9).

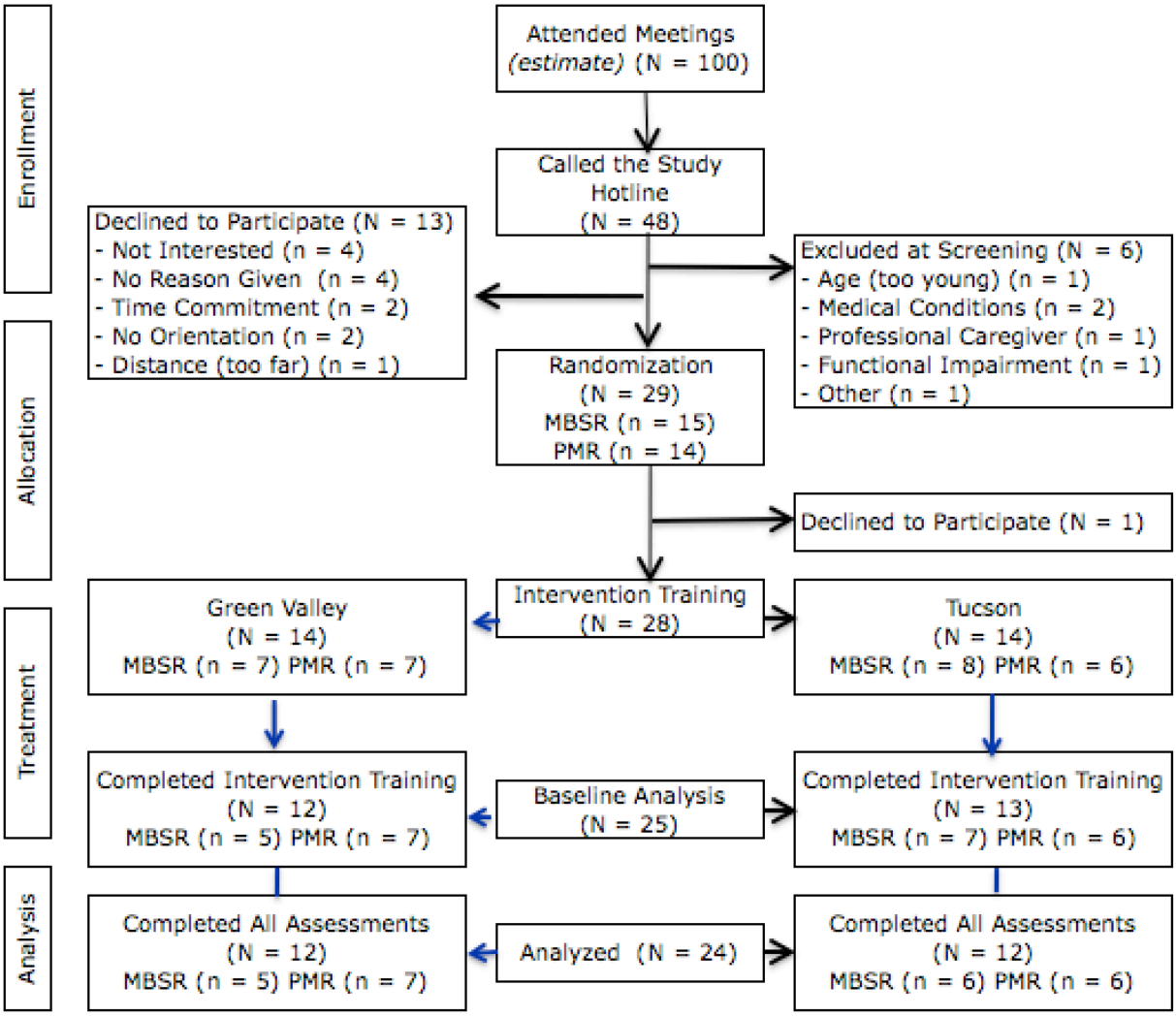


Figure 2.1 CONSORT flowchart of participants at each phase of study.

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 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 assessment questionnaire packet along with verbal and written instructions for saliva collection. They were instructed to complete the questionnaire packets and collect saliva a day or two before the first laboratory assessment where their blood pressure would be measured and additional saliva would be collected.

Of the 28 participants who began intervention training, 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 fall and subsequent hospitalization. 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 relaxation practices, found it too painful to continue with the physical exercises, 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, and then later received either by mail or during class attendance. Questionnaire packets were completed in the comfort of participants' homes on five occasions: Before the interventions began (baseline), after the interventions ended (post-intervention), and at 8 weeks, 6 months and 1 year 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. Home-collected saliva was frozen according to written instructions and returned to the laboratory either by the participant or collected by research staff. Blood pressure measurements and saliva were collected at each of the five assessment visits to the laboratory at the University of Arizona. All participants completed daily logs during the intervention training and during 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 one 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 provided parking and meeting facilities with easy access and were familiar to the participants. Each site had the same exercise equipment (yoga mats, yoga bolsters and blankets) as well as chairs and access to walls for support to facilitate similar experiences with the exercise components of the interventions.

The 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. MBSR was developed by Jon Kabat-Zinn at the University of Massachusetts Medical School in 1979. The MBSR program includes structured class activities, homework assignments and audio recordings to facilitate home practice. Following the standard MBSR curriculum guide (Blacker, Meleo-Meyer, Kabat-Zinn, & Santorelli, 2009), classes over an 8-week period are 2.5 hours in length, with the first and final classes being 3 and 3.5 hours long, respectively. This additional time allows 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 8 weekly classes, MBSR includes a one-day silent retreat, known as *A Day of Mindfulness*, lasting 7.5 hours, which occurs on a weekend between weeks 6 and 7. Classes focus on three meditation techniques: Seated meditation, walking meditation and meditation in supine position, which is referred to as a "Body Scan", all of which are designed to generate attention and awareness of the physical body, and of one's emotions and thoughts. Mindful movement,

which consists of two sets of gentle hatha yoga postures—one series of standing postures and a second series of postures conducted while lying on the floor—is practiced with the same attitude of present-moment awareness that is taught in the Body Scan, sitting and walking meditations.

Other components of MBSR include information about stress and its impact on health in addition to working with the dynamic aspects of the group. Each class includes opportunities for communication, questions and sharing of experiences with the practices. Through these formal mindfulness practices, participants are taught to focus their attention, first on single points of focus, beginning with awareness of breathing, expanding to attention of bodily sensations and the whole body, then awareness of sounds, awareness of emotions and thoughts as "events" in consciousness, and finally expanding to momentary awareness of all stimuli as they present themselves. This final meditation practice is called "choiceless awareness" or "open presence." During the development of these practices, there is a strong emphasis on employing a foundational attitude of nonjudgmental acceptance of each stimulus or group of stimuli as they occur. Taken together, the mindfulness practices are designed to cultivate an inherent awareness of oneself, and through them, to develop self-regulatory skills, and to promote positive health behaviors and emotional resilience to life challenges.

Homework includes 45–60 minutes of formal practices six days a week during the program. Participants receive audio recordings of the practices and a home practice manual to aid with homework. In addition to daily formal practice, participants are encouraged to engage in informal practices on a daily basis. These informal practices consist 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 is 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, following standard instructions for gentle yoga, minor modifications were made to the yoga postures as needed 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. Otherwise, weekly classes followed and adhered to the standard MBSR manual.

Progressive Muscle Relaxation (PMR)

The PMR intervention combines the structure and some components of MBSR, while replacing mindfulness practices with relaxation therapies. The relaxation therapies used in PMR are progressive muscle relaxation and autogenic training. The PMR intervention is 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 has structured class activities, homework assignments and audio recordings to facilitate home practice.

Progressive muscle relaxation is a somatic relaxation training intervention that teaches relaxation of muscle groups and diaphragmatic breathing. It is a systematic, stress management technique developed by MD and physiologist Edmund Jacobson in 1929, originally as a treatment for anxiety. Jacobson discovered that tension and exertion was always accompanied by a shortening of the muscular fibers, and that relaxation of the muscle fibers led to a reduction in physical tension, which in turn, reduced symptoms of anxiety. He devised a way to systematically relax muscle groups by first tensing them for several seconds, and then releasing the tension. Progressive muscle relaxation involves alternately tensing and releasing the tension in various muscle groups in a systematic way that targets muscles covering the entire surface of the body. Progressive muscle relaxation has been further developed to include guided imagery exercises as a form of mental relaxation and a cognitive component explaining the stress process. Progressive muscle relaxation is widely used in physical rehabilitation and is available for home use on audio recordings.

Autogenic training is a psychophysiologically based form of autonomic self-regulation (Linden, 1994). Developed in Germany by psychiatrist Johannes Schultz in 1932, autogenic training is a technique that facilitates responses to one's internal commands. It was originally designed to treat physiological symptoms of anxiety. Autogenic training involves learning a set of 6 simple phrases, each one repeated either silently or subvocally. It was considered a good substitute for the Body Scan in MBSR,

while progressive relaxation training was substituted for the formal mindfulness practices of MBSR.

The PMR intervention for the present study was structured to include 8 weekly meetings and a day of relaxation, matching the length and structure of the MBSR program. Gentle hatha yoga—using the same sets and sequence of postures as in MBSR—was included to match MBSR's mindful movement, with an emphasis on posture repetition rather than awareness of body and breath and mindful practice. The didactic stress component of MBSR was also retained in the PMR intervention. Progressive muscle relaxation was taught following the 1973 instruction manual (Bernstein & Borkovec, 1973). Updated autogenic training phrases, for example, "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). The PMR intervention was designed by the investigator as an alternative active control condition closely matched to the MBSR training program but based on cognitive behavioral therapy techniques of relaxation. Both interventions were taught by the investigator, who is trained in relaxation therapies and was trained as an MBSR instructor by Melissa Blacker and Florence Meleo-Meyer at the Center for Mindfulness in Medicine, Health Care and Society, Worcester, MA. All recordings utilized in both interventions were made by the investigator.

Laboratory Assessments

All laboratory assessments were conducted at the Neuropsychology, Emotion and Meditation Laboratory of the University of Arizona. Laboratory assessments were

scheduled during academic vacations when possible and included weekend days to facilitate ease of travel through the university campus. Parking was provided at the laboratory, and when participants arrived, research staff assisted with parking and escorted them throughout the visits. One-and-a-half hours were allocated for each visit. In addition to the 8-week intervention training and five laboratory assessments, participants were offered two optional booster or reunion classes between the fourth and fifth assessments, which were 6 months apart. The optional classes were designed to support the respective practices and to reduce attrition for the 1-year follow-up assessment. Professional caregivers—paid for by the study—were made available so that participants could attend intervention training and laboratory assessments without the additional financial or emotional burden associated with leaving their care recipient at home. However, if the participant chose to bring their loved one to the assessment, a research assistant was assigned to stay with him or her in a separate waiting room during that time.

At the laboratory, research staff reviewed completed questionnaire packets and saliva samples, ensuring that all questions had been answered and saliva tubes were frozen and securely capped. In the testing room, participants removed their shoes and had their weight and height measured to calculate their body mass index prior to seating and preparation for physiological testing. The sound-protected testing room was equipped with a lazy boy chair, footrests of differing heights, and computer monitor and audio equipment to facilitate instructions and communication between participants and the experimenter, who was in an adjacent control room. The experimenter observed and supervised the testing room procedure through a connecting window. After set-up and test runs of electrocardiography (ECG) and respiration rate recording (analysis of these

measures is not reported here) and placement of the digital blood pressure meter, participants were instructed to remain seated as quietly and comfortably as possible for the duration of testing. In particular, they were instructed to limit arm movement to a minimum and not to lean forward while completing tasks during or between recording periods. A research assistant remained with the participant during testing. Test instructions were delivered systematically and simultaneously in both visual and auditory modes. The delivery of test instructions was facilitated via E-Prime 2.0 stimulus presentation software (Psychology Software Tools, Inc., Sharpsburg, PA). Pre-recorded audio was delivered through headphones that were adjusted for participants' comfort and hearing abilities while text slides of large font size (32 pt sans serif) of the exact audio instructions were shown on a computer monitor (placed approximately 24" in front of the participants' chair). These steps were taken to ensure that instructions were understood and followed. Test instructions included pauses to allow participants to ask questions. The first BP measurements were initiated during the introductory slide, after participants had been seated for 5–10 minutes during equipment set-up and testing. Participants were then instructed to complete a 5-minute paced breathing task. This involved breathing along with a neutral electronic tone, inhaling to a rising pitch and exhaling to a lowering pitch. The paced breathing task constituted a resting baseline assessment. Participants were then asked to complete a Mundane Events Recall (MER) control task. The MER task involved firstly to think about and subsequently to talk about two non-emotional daily activities (doing the laundry and making a grocery list). Instructions included to "concentrate and mentally reflect on the questions and then describe them with as much detail as possible". The MER and CMAT tasks (described below) were each allotted a

20-second reflection period followed by a 60-second verbal description period. The reflection and verbal description periods were initiated *after* the end of the audio instructions and therefore allowed time to read and/or hear those instructions before beginning. Participants' verbal descriptions of the MER task and CMAT were recorded for analysis but are not reported here. The first MER question that was displayed on the computer monitor and accompanied by audio was: "Please think about how you do your laundry. What are the steps involved in doing your laundry? Create a vivid image of the steps involved in doing your laundry in your mind. Concentrate and mentally reflect on doing your laundry". The MER task facilitated potential physiological changes from resting baseline to non-emotional mental activation and concentration tasks. It also served as a control for the emotionally stressful CMAT that was to follow, since any physiological changes that would occur from the MER task to the CMAT would be specific to the content of the CMAT rather than to physiological changes associated with an orienting response or the effects of mental concentration. Finally, since the MER task and CMAT involved the same format of "thinking about" followed by "talking about" steps, the MER task acted as a practice trial for the CMAT. Including instructions and provided the participants had no questions, the MER task took approximately 5 minutes 30 seconds to complete.

Participants then completed a task appraisal questionnaire that rated their experience of the MER task and provided the first of three saliva samples. The saliva collection was followed by the Caregiver-Specific Mental Activation Task (CMAT). In the CMAT, participants were asked to think about their experience as a caregiver and in particular, to remember "a recent caregiving experience with your loved one that was

very difficult and stressful". If they could not remember a recent difficult event (all caregivers except two whose spouses had died recalled recent events), then any event that was considered difficult and stressful was acceptable. Following the same procedure as the MER, participants were asked to first think about and then talk about that event and then answer an additional four questions related to the event: 1) What did you do in response to this event? 2) How did you feel in response to this event? 3) How did you feel towards your loved one in response to this event? 4) How do you feel about the future as a result of this event? Following the CMAT, participants provided a second saliva sample and again completed the same task appraisal questionnaire, this time using those questions to rate their experience of the CMAT. Including initial task instructions and provided that participants had no questions, the CMAT was approximately 11 minutes in length. When the task appraisal questionnaire was completed, participants then undertook another 5-minute paced breathing task to facilitate recovery from any discomfort experienced during the CMAT. The second BP measurements were initiated at the beginning of this paced breathing task to assess potential BP changes occurring as a result of the stressful CMAT. Upon completion of the breathing task, the physiological recording equipment was removed from the participant.

The third and final saliva sample was collected 21 minutes after the initiation of the emotional stressor. The initiation of the stressor was considered to be immediately after the audio instructions of the first CMAT question, which was: "Please think about a recent caregiving experience with your loved one that was very difficult and stressful". The saliva collection times of zero minutes post-stressor and 21 minutes after stressor onset are based on meta-analyses of cortisol responses to laboratory-controlled acute

psychological stressors (Dickerson & Kemeny, 2004). Depending on how long it took participants to complete the second task appraisal questionnaire and provide the second saliva sample after the CMAT ended, that 21-minute period would end either during or after removal of the physiological recording equipment. Regardless of when it occurred, participants did not stand up until after the third and final saliva sample had been collected. Participants were thanked for their time, paid $10.00 for each assessment and escorted to their vehicle.

Self-Report, Physiological and Biological Measures

The primary outcomes of symptoms of depression, perceived stress, perceived loneliness, dispositional mindfulness, and self-compassion were measured using self-report scales. Secondary outcomes include additional self-report scales assessing perceived burden, patient problem behaviors and caregiver reaction to the problem behaviors, and sleep quality. Secondary physiological outcomes included systolic blood pressure and salivary cortisol. 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.

The Geriatric Depression Scale (GDS-15)

Self-reported symptoms of depression were assessed using the Geriatric Depression Scale (GDS; Sheikh & Yesavage, 1986), which has been tested and used extensively with older adult populations. The original 30-item questionnaire was found to

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

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 ($n = 510$), internal reliability of the original, 14-item instrument was estimated at 0.85 and test-retest reliability (after 2 days) at 0.85. The PSS correlates well with depressive symptoms as measured by the Center for Epidemiologic Studies Depression Scale (CES-D) with correlations across groups of 0.76 and 0.65 ($p < .001$). Correlations with the Physical Symptom Checklist (CHIPS) range from 0.52 to 0.70 ($p < .001$). Mitchell, Crane, & Kim (2008) tested the 10-item scale in a population of survivors of suicide ($n = 60$) and found a reliability coefficient of 0.91, and split-half reliability of 0.90. Convergent validity as measured against the Impact of Event Scale (IES) and Posttraumatic Stress-Arousal Symptoms Scale (PTS-AS) showed correlations of 0.54 and 0.69, respectively ($p < .01$), while concurrent validity was seen when compared to the mental health component score of the general health survey SF-36 ($r = – .70$, $p < .01$). The 10-item version of the PSS was used in this study.

The Revised UCLA Loneliness Scale (UCLA-R Loneliness Scale)

The Revised UCLA Loneliness Scale (Russell, Peplau & Cutrona, 1980) is a

20-item self-report questionnaire that assesses perceived levels of loneliness. The questionnaire has 10 negatively worded and 10 positively worded items whose sum is designed to detect differences in perceived loneliness that occur in everyday life. The UCLA-R Loneliness Scale has a high internal consistency of 0.94, and has been found to correlate well with a self-labeling loneliness index (r = .705), with measures of depression (r = .505) and self-esteem (r = – .493). Concurrent validity has been shown with significant correlations between levels of loneliness and measures of social activities, including the amount of time spent alone (r = .41), the number of times spent dining alone (r = .34) and the number of weekend nights spent alone (r = .44), all ps < .001. Higher scores indicate higher levels of loneliness.

The Mindful Attention Awareness Scale (MAAS)

Perceived levels of dispositional 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 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 a series of studies totaling 1,253 participants, internal consistency was 0.82, test-retest reliability was 0.81 (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 well with openness to experience as measured by the NEO Five-Factor Inventory (r = .18, p = .01).

Significant negative correlations have been observed with rumination and social anxiety. Baer, Smith, Hopkins, Krietemeyer, and Toney, (2006) found good internal consistency for the MAAS (0.86) 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. Self-compassion 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 has been found to be 0.91, and test-retest reliability has been found to be 0.92 (Neff, 2003). Construct validity was confirmed by comparing the SCS to instruments that measure positive and negative attributes. Significant negative correlations have been observed with the self-criticism subscale of the Depressive Experiences Questionnaire (DEQ; Blatt, D'Afflitti, & Quinlan, 1976) ($r = –.65$, $p < .01$). Other negative correlations have been 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). Significant positive correlations have been found 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 ($r = .55$, $p < .01$). The SCS also correlates significantly with measures of life satisfaction. Baer et al. (2006) have found significant positive correlations between the SCS and five separate mindfulness questionnaires (rs = .36–.59, ps < .01).

The Zarit Burden Interview (ZBI)

The short version of the Zarit Burden Interview (ZBI; Bédard et al., 2001) assesses the distress experienced by family caregivers of elderly and disabled persons. The original, 22-item questionnaire was developed as a composite measure and provides a single summary of the perceived impact of the burden of caregiving. It is the most consistently used instrument in dementia caregiving research (Bédard, Pedlar, Martin, Malott, & Stones, 2000). Internal reliability has been estimated at 0.88, and test-retest reliability at 0.71. Validity has been estimated by correlating the total score with a single global rating of burden ($r = .71$) and by correlation with the total score and subscales of the Brief Symptom Inventory. The 12-item version was used in this study and has correlations with the original scale ranging from 0.92 to 0.97 and similar correlations with the Activities of Daily Living (ADL) scale and the frequency of problem behaviors among care recipients.

The Revised Memory and Behavior Problems Checklist (RMBPC)

The Revised Memory and Behavior Problems Checklist (RMBPC; Teri et al., 1992) contains 24 items that was used to assess the frequency of and the caregiver's

reactions to behavioral disturbances of a dementia patient. With a population of 198 dementia patients and their accompanying caregivers (mean age = 74), factor analysis has confirmed three factors consistent with three subscales: Memory-related problems, depression-related problems and disruptive behavior problems. Reliability has been estimated at 0.84 for patient behavior and 0.90 for caregiver reaction. Validity has been measured through comparison with the Hamilton Depression Rating Scale (HDRS) and the Mini-Mental State Examination (MMSE). The depression-related problems subscale correlates with the HDRS ($r = .44$, $p < .01$) but not with cognitive measures (MMSE), providing both concurrent and discriminant validity. The memory-related problems subscale correlates with the MMSE ($r = .48$, $p < .01$) and not with the HSRD, providing convergent and discriminant validity for that subscale. Replication by Roth et al. (2003) confirmed the 3-factor model of the RMBPC ($n = 1,229$).

The Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) assesses subjective sleep quality and disturbances over a 1-month time interval and was used to determine the quality of sleep of caregivers during the course of the study. The PSQI is a well-established instrument with high internal consistency (0.80). It correlates well with other measures of sleep problems and sleep restlessness, and correlates poorly with unrelated constructs such as nausea (Carpenter & Andrykowski, 1998). The PSQI consists of 19 items that combine to form seven equally weighted component scores. These scores are aggregated to obtain a global score ranging from 0–21. Higher scores indicate poor sleep quality. The PSQI has a sensitivity

rating of 89.6 percent and specificity of 86.5 percent for identifying sleep disorder using a cut-off score of five (Buysse et al., 1989).

The Mini-Mental State Examination (MMSE)

The Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) was administered at the beginning and end of the study to assess the cognitive status and functional impairments of the participants. The MMSE is a commonly used screen that provides information on attention, immediate memory, orientation, language, and praxis. Education-specific norms have been determined with cut-off scores of 21 (from a total score of 30) for those with middle-school education, 23 for those who have graduated from high school, and 24 for participants who have a college education.

Credibility and Expectancy Questionnaire (CEQ)

Credibility of both interventions was assessed using a slightly modified version of the Credibility and 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 0.81 to 0.86, and expectancy scores ranged from 0.79 to 0.90), and the total

scale (using both factors) with standardized alpha was between 0.84 and 0.85. Test-retest reliability has been found to be 0.82 for expectancy and 0.75 for credibility over a 1-week period (Devilly & Borkovec, 2000).

In the present study, minor modifications to the questions made them appropriate to caregivers' expectancy and credibility in the interventions for reducing symptoms of stress. Modifications include 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.

Task Appraisal Questionnaire

A task appraisal was completed immediately after the MER task, and the same task appraisal was completed immediately after the CMAT during the laboratory emotional stress test, following the protocol established by Sbarra et al. (2009). All items were scored on a 7-point Likert scale, with higher scores indicating increased emotional difficulty and effort exerted to complete tasks. High internal consistency was found for both the MER task (0.81) and CMAT (0.80). Four of the items were computed to create a Task-Rated Emotional Difficulty (TRED) score. TRED items include: 1) "Overall, across all items, how upsetting did you find this task?" 2) "How much effort did you make to control your emotions during the task?" 3) "How emotionally difficult did you find it to think about your loved one and your relationship history with him/her?" 4) "How much anxiety or bodily tension did you experience during this task?" A TRED difference score between the tasks (CMAT score minus MER score) indicated how emotionally difficult the CMAT questions were relative to the MER questions. Additional individual items assessed the participants' abilities to focus on the tasks, how engaging the tasks were

(how well they create mental images of events) and how realistic their experience was compared to thinking about the experience outside the laboratory.

Salivary Cortisol

Salivary cortisol samples were collected upon awakening, 30 minutes after awakening, at 4:00 p.m. and 9:00 p.m., one or two days prior to each 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. In addition to the diurnal collection of saliva, samples were collected three times during the CMAT laboratory assessment: The first sample was collected immediately prior to the CMAT, the second immediately after the end of the CMAT, and the third sample was collected 21 minutes after emotional stressor onset. Salivary cortisol samples were collected using the passive drool method with the optional assistance of straws. Samples were stored and frozen prior to analysis in small, capped plastic tubes (SaliCap; IBL – Translantic Corp., Toronto, Canada).

Systolic Blood Pressure

Blood pressure (BP) was measured twice during each laboratory assessment at the University of Arizona: The first BP measurements were taken before the beginning of the CMAT, and the second BP measurements were taken at the end of the CMAT. BP readings were obtained four times at 2-minute intervals at each of the two time points to improve precision of estimates. The BP readings were obtained via the cuff auscultatory method using a digital blood pressure meter (UA-751, Lafayette Instruments, Indiana).

The primary and secondary outcome measures including the biological measures were collected on five occasions: Before the interventions began (pre-intervention), immediately after the interventions ended (post-intervention), and 8 weeks, 6 months and 1 year 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 had signed consent forms, and again at the beginning of the second class of each intervention. Secondary biological outcomes were measured at the Neuropsychology, Emotion and Meditation Laboratory at the University of Arizona.

Study Design and Rationale for Control Condition Selection

The study design originally included both active and passive controls, with a passive or wait-list arm of the study intended to be re-randomized into a second stage of intervention training following the recycled wait-list 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 5 general linear mixed-effects model (two independent intervention groups by five assessments).

Statistical Analysis

Independent-samples *t*-tests were used to determine any demographic differences between the groups. General linear mixed-effects models were used to analyze the main intervention effects and interactions over five assessments both between and within groups.

A five (time: Baseline, post-intervention, 8-week, 6-month and 1-year follow-up assessments) by two (group: MBSR, PMR) linear mixed-effects analysis of variance was used to determine whether the participants' psychological and biological measures showed improvement over time, and whether the groups differed in the pattern of change over time. Each of the primary and secondary hypotheses were analyzed separately using this analysis with alpha set at .05. No differences were expected in measures at baseline since the participants were randomized into their respective groups.

Systolic blood pressure (SBP) was measured twice during each assessment and yielded two systolic data points. SBP values were logarithmically transformed to normalize distributions. A general linear mixed-effects analysis of variance was used to analyze the SBP data. Group and assessment (time) were modeled as fixed effects, while pre-stress test to post-stress test SBP was nested within assessment and modeled as a random effect.

Cortisol values were logarithmically transformed to normalize distributions. Three aspects of the home-collected cortisol profile were assessed: Diurnal cortisol, the

cortisol awakening response (CAR), and daily average cortisol levels (DAC). The awakening response is defined as the change in cortisol level from the first sample (directly after waking) to the second sample, which is taken 30 minutes after the first sample (de Vugt et al., 2005). The daily average cortisol level is the average of the cortisol upon awakening, the 4:00 p.m. and 9:00 p.m. samples. A general linear mixed-effects analysis of variance was used to analyze the diurnal cortisol data. Group and assessment (time) were modeled as fixed effects, while the diurnal cortisol was nested within assessment and modeled as a random effect. Linear mixed-effects analysis of variance were also used to determine changes in CAR and DAC over time and whether the groups differed on the pattern of change.

During the laboratory assessment, three samples of saliva were collected: The first immediately after the end of the Mundane Events Recall task (MER), the second immediately after the end of the Caregiver-Specific Mental Activation Task (CMAT—the emotional stress task), and the third sample was collected 21 minutes after the initiation of the emotional stressor of the CMAT. Lab cortisol data were natural–log transformed to normalize distributions. A general linear mixed-effects analysis of variance was used to analyze the lab cortisol data. Group and assessment (time) were modeled as fixed effects, while the first and second lab cortisol samples, named the stressor-specific cortisol response, and the second and third samples, termed the cortisol recovery, were nested within assessment and modeled as a random effect.

Data were analyzed on participants who completed intervention training and at least three assessments.

CHAPTER 3

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 three who discontinued their training at the early stages (classes 1 and 3). Twenty-seven participants (96 percent) identified as White/Anglo, and one participant (4 percent) identified as Hispanic or Latino. Caregivers self-reported the neurocognitive diagnosis of their care recipients. Twenty-two participants stated that their care recipient had been diagnosed with a form of dementia: Nine with Alzheimer's disease (two of whom were recently deceased), seven with mild cognitive impairment (three of whom had co-morbid Parkinson's disease), five with dementia (two of whom had co-morbid Parkinson's disease, and one with co-morbid REM sleep disorder), and one with Lewy body dementia. Six caregivers stated that their care recipients exhibited cognitive impairments secondary to Parkinson's disease but had not been formally evaluated for nor diagnosed with cognitive impairment.

Twenty-five caregivers completed their respective interventions and pre- and post-intervention assessments, and 24 completed three or more 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 3.1).

Table 3.1

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.

Blinding was not possible as the principal investigator taught both interventions and conducted and supervised the assessments. In addition, a few of the participants were good friends and several others were members of informal caregiver support groups. These participants reported meeting regularly and discussing their participation in the study. Intervention trainings ran concurrently, necessitating the joining of both MBSR groups for their respective day-long retreat during week 6 of the intervention. The two PMR groups were also brought together for their day of relaxation during week 5 of their intervention. For a discussion on the methodological issues of double-blinding in mindfulness-based intervention studies, see Davidson and Kaszniak (2015).

Credibility and Expectancy

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 percent) 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). A general linear mixed-effects analysis of variance showed that the interaction of group by time was 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 percent), indicating that participants expected moderate positive improvements in their subjective levels of stress (see Table 3.2).

Intervention Veracity

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 Melissa Blacker, MA, a director of the Oasis Institute for mindfulness-based professional education and training at the Center for Mindfulness, University of Massachusetts Medical School, Worcester, MA. 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 teaching these techniques and has produced commercially available professional recordings of both relaxation methods.

Table 3.2

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.

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. The overall evaluation of the audio

recordings of MBSR home practice training materials by Melissa Blacker 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 percent, PMR = 94 percent). 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 percent) attended all 9 classes (which included 8 weekly and 1 full day meetings), 6 participants attended 8 classes (24 percent), 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 received log books designed for their respective interventions 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 Bernstein and Borkovec instruction manual (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.

One MBSR group participant and two PMR group participants did not return their log books for weeks 1 to 8. One additional MBSR participant's log book data for weeks 1 to 8 was excluded from analyses because the check marks in the log book were not consistent with weekly instructions for practice. For weeks 9 to 16, three Daily Log Books were not returned by the MBSR group, and 2 log books were not returned for the PMR group. Recommended home practice amounts began with 30 minutes per day for 6 days for the PMR group and 45 minutes per day for 6 days for the MBSR group during week 1 of intervention training. Recommended practice amounts increased during the second week to 60 minutes per day for MBSR and 50 minutes per day for PMR. Both groups were instructed to practice for 60 minutes per day from the third week onwards.

Daily practice continued to be 60 minutes per day thereafter, for 6 days per week during 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 percent of the recommended home practice amounts during the first 8 weeks of intervention training, and 48 percent of recommended home practice amounts during the following 8 weeks. PMR participants reported an average of 50 percent of recommended practice amounts for the first 8 weeks and an average of 27 percent for the following 8 weeks of home practice. However, given the within group variability in home practice, a one-way analysis of variance comparing the 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*. In linear mixed-effects analysis of variance, there was a significant main effect of time, with both MBSR and PMR groups showing decreases in daily amounts of home practice from the first 8 weeks to the second 8 weeks, $F(1, 17) = 20.03$, $p < .001$. The group by time interaction was not significant. 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 3.1).

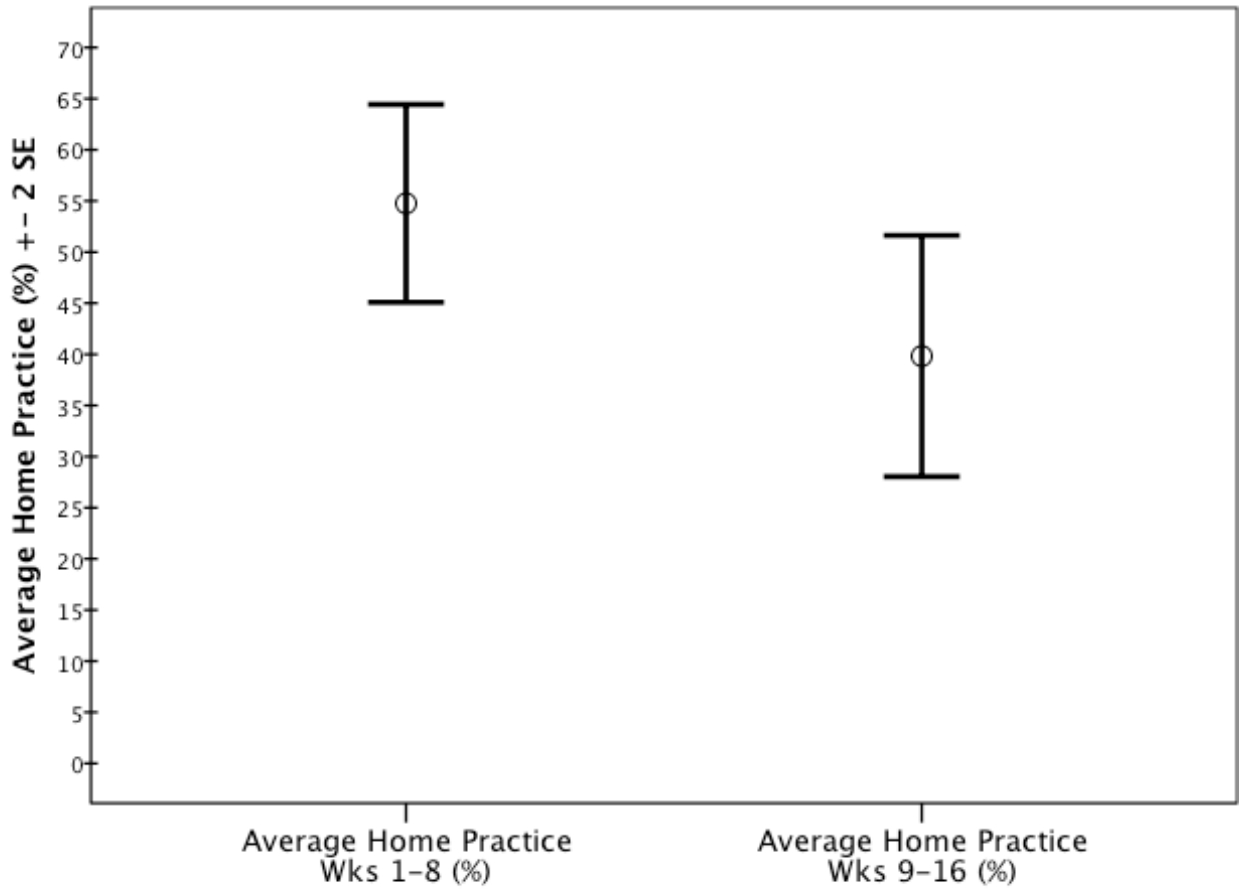


Figure 3.1 Daily Log Book home practice data collapsed across groups. This graph with standard error bars shows average daily amounts of home practice as annotated in log books by both MBSR and PMR groups combined together.

Primary Outcome Variables

Self-Reported Symptoms of Depression

Since the GDS-15 data were positively skewed, data analyses were conducted using natural log–transformed data. An independent samples *t*-test showed no differences between the groups on GDS-15 scores at pre-intervention, $t(23) = .90$, $p = .38$, *ns*. In linear mixed-effects analysis of self-reported symptoms of depression that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time, $F(4, 76) = 3.13$, $p = .02$, but no significant main effect of group. The group by time interaction was also non-significant. In tests of within-subject contrasts, there was a linear main effect of time that approached significance, $F(1, 19) = 3.90$, $p = .06$, *ns*, and a time by group quadratic interaction effect that also approached significance $F(1, 19) = 3.79$, $p = .07$, *ns* (see Figure 3.2).

For the MBSR group, the pairwise comparison from pre-intervention to post-intervention was significant, with $p = .003$. Pairwise comparisons for the MBSR group were also significant from pre-intervention to 8 weeks post-intervention ($p = .02$), and from pre-intervention to 1 year post-intervention ($p = .02$). None of these time-point pairwise comparisons were significant for the PMR group. Although both groups exhibited an increase in symptoms from post-intervention to the 8-week post-intervention period, the PMR group's scores had returned to their baseline level while the MBSR group's scores remained significantly below baseline. Pairwise comparisons showed that, for the MBSR group only, there was a significant pre- to post-intervention decrease in symptoms of depression and that this benefit in symptom change was maintained one year after the end of intervention training.

A group by time interaction was significant at post-intervention, $F(1, 23) = 6.24$, $p = .02$, at 8 weeks post-intervention, $F(2, 42) = 4.43$, $p =. 02$, and approached significance at 6 months post-intervention, $F(3, 60) = 2.43$, $p = .07$, *ns.* Symptom reduction was greater through the 8-week follow-up for the MBSR group. Linear mixed-effects analysis of variance revealed significant main effects of time across all assessments, indicating that both MBSR and PMR groups showed decreases in symptoms of depression from pre-intervention to post-intervention, $F(1, 23) = 15.53$, $p = .001$, in analysis that included 8-week post-intervention data, $F(2, 42) = 8.09$, $p = . 001$, and in analysis that added 6-month post-intervention data, $F(3, 60) = 4.20$, $p = .009$. In tests of within-subject contrasts, there was a significant cubic main effect of time, $F(1, 20) = 12.10$, $p = .002$, and a significant time by group quadratic interaction effect, $F(1, 20) = 5.98$, $p = .02$, at 6 months post-intervention. At 8 weeks post-intervention, tests of within-subject contrasts revealed a significant quadratic main effect of time, $F(1, 21) = 14.41$, $p = .001$, and a significant time by group linear interaction effect, $F(1, 21) = 4.64$, $p = .04$.

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 percent) 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. At 6 months post-intervention, a total of 5 participants met criteria for depression, and at 1 year post-intervention, a total of 3 participants (13 percent) met criteria for depression.

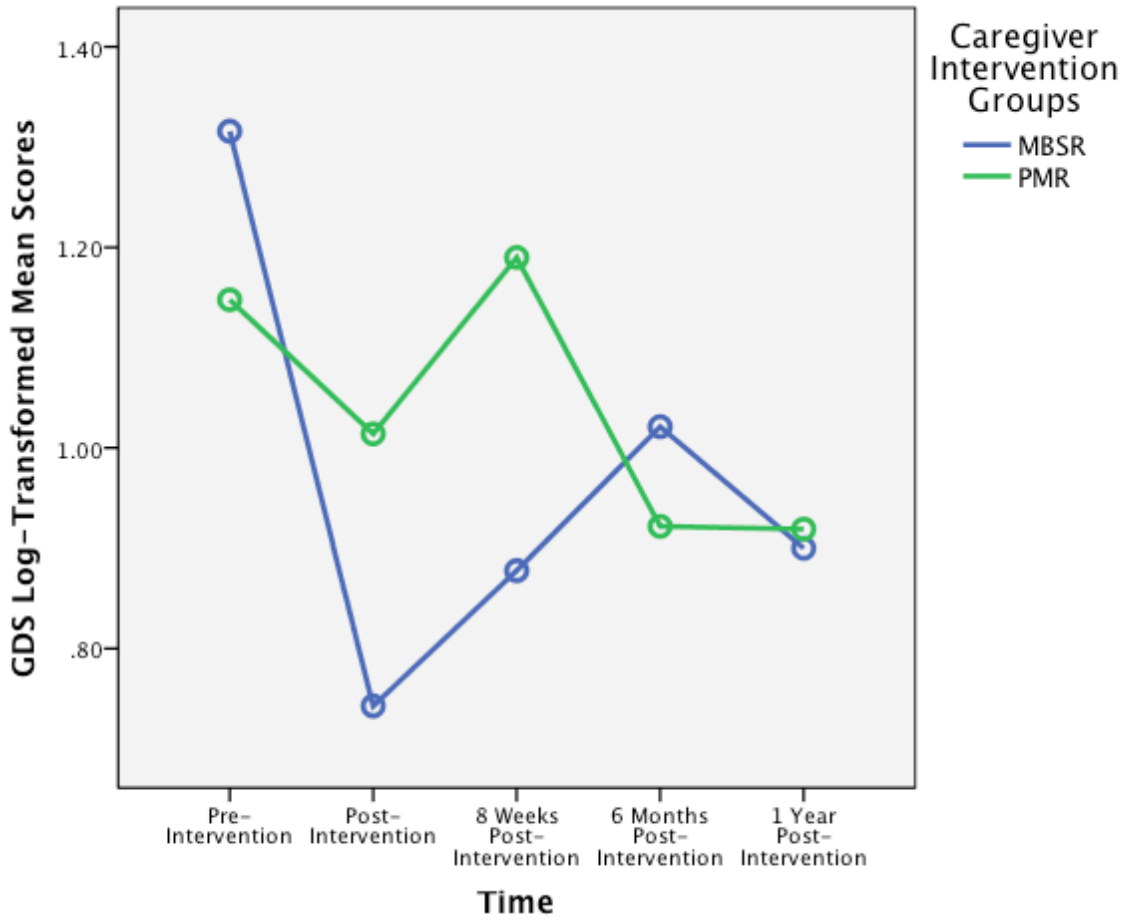


Figure 3.2 Geriatric Depression Scale (GDS) over five assessments. This line graph shows differences by group of symptoms of depression at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the interaction from pre- to post-intervention is significant, and the apparent interaction from pre-intervention to 6 months post-intervention is not significant.

Further examination showed that both groups had 4 participants who met the cut-off for depression at pre-intervention. 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 at or above the cut-score for depression symptoms and the PMR group had 3 participants at or above the cut-score. By the fourth assessment, 6 months post-intervention, the MBSR group had 3 participants and the PMR group had 2 participants that met criteria for depression, and by the final assessment 1 year post-intervention, the MBSR group had 1 participant with GDS scores meeting or above the cut-score for depression symptoms, while the PMR group had 2 participants at or above the cut-score. At the beginning of the study (pre-intervention), 32 percent of caregivers met criteria for symptoms of depression using the GDS-15 scale. At the end of the study, approximately 14 months later, only 13 percent of participants met criteria for symptoms of depression. While reductions were observed in both groups, the MBSR group showed a nominally greater reduction in the number of participants with depression symptoms, reducing from a total of 4 participants who met criteria at pre-intervention to only one by the end of the study.

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*. In linear mixed-effects analysis of perceived stress that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant group by time interaction, $F(4, 76) = 2.83$, $p = .03$, but no significant main effect of time or group. In

tests of within-subject contrasts, there was a group by time linear interaction effect that approached significance, $F(1, 19) = 4.19$, $p = .055$, *ns*. Symptom reduction was greater for the PMR group (see Figure 3.3). For the MBSR group, the pairwise comparison was significant from pre-intervention to post-intervention, ($p = .02$). Pairwise comparisons for the MBSR group were also significant from pre-intervention to 8 weeks post-intervention ($p = .02$), and approached significance from pre-intervention to 6 months post-intervention ($p = .09$). For the PMR group, a pairwise comparison was significant from pre-intervention to 1 year post-intervention ($p = .01$).

Linear mixed-effects analysis of variance revealed significant main effects of time across the first four assessments, indicating that both MBSR and PMR groups showed decreases in perceived stress from pre-intervention to post-intervention, $F(1, 23) = 8.26$, $p = .009$, in analysis that also included 8-week post-intervention data, $F(2, 42) = 3.13$, $p = .05$, and in analysis that added 6-month post-intervention data, $F(3, 60) = 2.87$, $p = .04$. In tests of within-subject contrasts, there was a significant linear main effect of time, $F(1, 21) = 4.50$, $p = .05$, at 8 weeks post-intervention, and a significant linear main effect of time, $F(1, 20) = 5.50$, $p = .03$, at 6 months post-intervention. Group by time interaction effects were non-significant at pre-intervention, post-intervention, 8 weeks post-intervention, and 6 months post-intervention. Symptom reduction was similar for both groups from pre-intervention to post-intervention, and also similar at 8 weeks post-intervention and at 6 months post-intervention. At 1 year post-intervention, there was a significant decrease in symptoms for the PMR group, and a return to baseline for the MBSR group. Further analysis of the raw data at 1 year post-intervention revealed that 5 participants from the

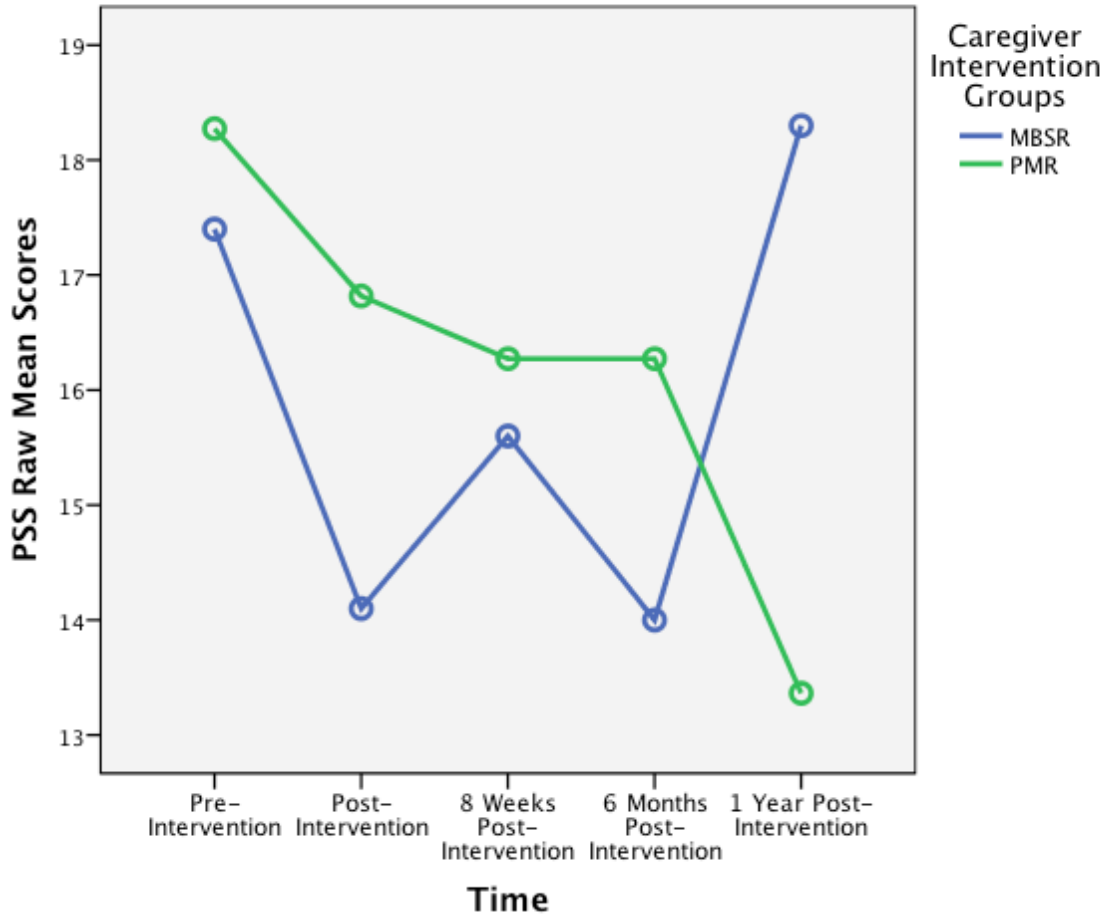


Figure 3.3 Perceived Stress Scale (PSS) over five assessments. This line graph shows differences by group of perceived levels of stress at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the interaction from pre-intervention to 1 year post-intervention is significant.

MBSR group had unusually large increases in scores from 6 months post-intervention to 1 year post-intervention. These scores could have been associated with increased stressors that occurred at that time. In addition, 4 participants from the PMR group had significant decreases in scores from 6 months post-intervention to 1 year post-intervention. These unusual scores account for the group by time interaction. Since Zarit Burden Interview scores (see below) did not show significant increases or decreases

from pre-intervention to 1 year post-intervention for either group, it seems unlikely that the stressors are specific to the caregiving role.

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*. In linear mixed-effects analysis that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time, $F(4, 76) = 4.82$, $p = .002$, but no significant group main effect or group by time interaction effect (see Figure 3.4). In tests of within-subject contrasts, there was a significant linear main effect of time, $F(1, 19) = 8.84$, $p = .008$, and also a significant cubic main effect of time, $F(1, 19) = 6.35$, $p = .02$. For the MBSR group, the pairwise comparison was significant from pre-intervention to 1-year post-intervention ($p = .02$). Pairwise comparisons were also significant for the PMR group from pre-intervention to post-intervention ($p = .04$), from pre-intervention to 1-year post-intervention ($p = .04$), from post-intervention to 8 weeks post-intervention ($p = .02$), and from 8 weeks post-intervention to 1 year post-intervention ($p = .009$).

Linear mixed-effects analyses of variance revealed significant main effects 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, $F(1, 23) = 10.06$, $p = .004$, in analysis that included 8-week post-intervention data, $F(2, 42) = 6.97$, $p = .002$, and in analysis that also included 6-month post-intervention data, $F(3, 60) = 5.07$, $p = .003$. Further within-subjects contrasts using pre-intervention, post-intervention, and 8-week post-intervention data revealed a significant quadratic main

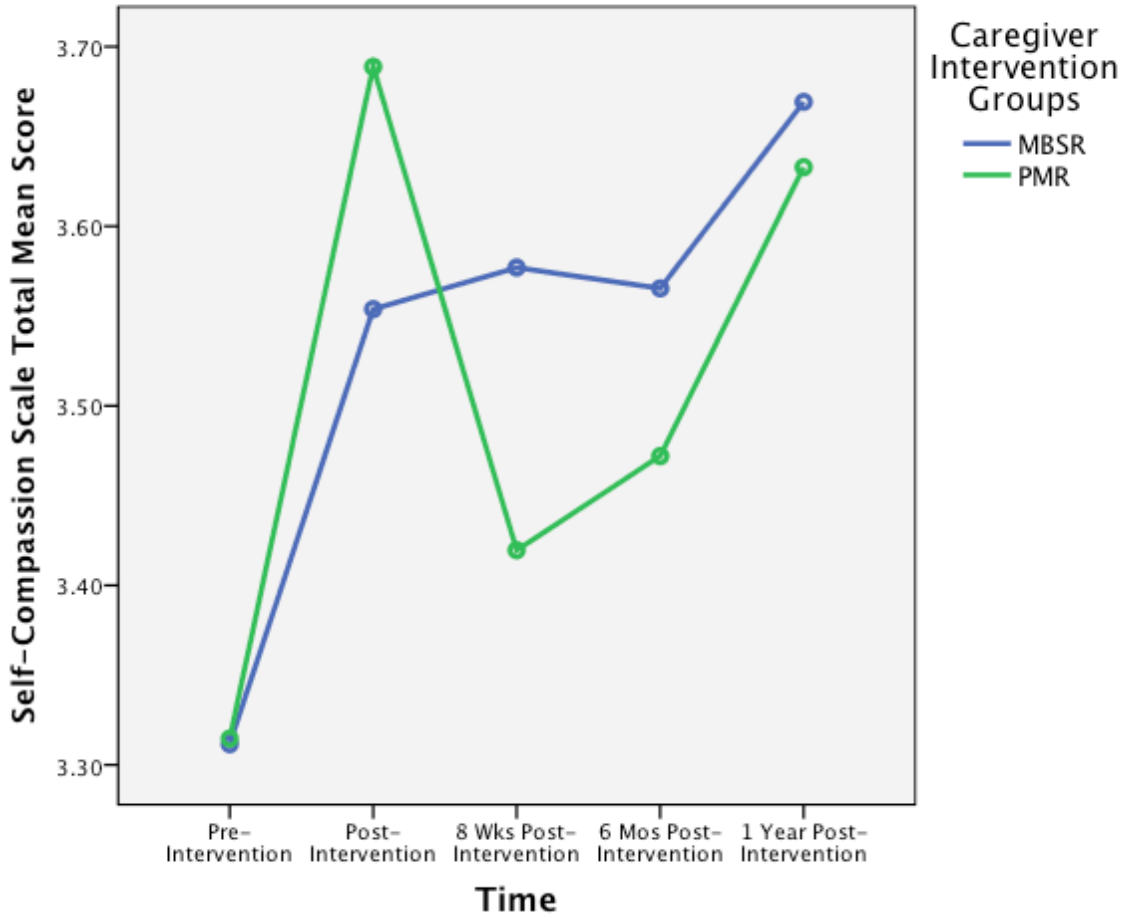


Figure 3.4 Self-Compassion Scale (SCS) total mean scores over five assessments. This line graph shows differences by group of perceived levels of self-compassion at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the apparent interaction from post-intervention to 8 weeks post-intervention is not significant.

effect of time, $F(1, 21) = 8.37$, $p = .009$, and a significant linear main effect of time, $F(1, 21) = 5.42$, $p = .03$. Within-subjects contrasts using pre-intervention, post-intervention, 8-week post-intervention and 6-month post-intervention data also revealed a significant cubic main effect of time, $F(1, 20) = 6.75$, $p = .02$ and a significant quadratic main effect of time, $F(1, 20) = 5.41$, $p = .03$.

In addition to the self-compassion total 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. In linear mixed-effects analysis of the Self-Kindness subscale that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time, $F(4, 76) = 5.19$, $p = .001$, but no significant group main effect or group by time interaction effect (see Figure 3.5). In tests of within-subject contrasts, there was a significant linear main effect of time, $F(1, 19) = 5.46$, $p = .03$, and also a significant cubic main effect of time, $F(1, 19) = 8.72$, $p = .008$. Linear mixed-effects analyses of variance of the SCS Self-Kindness subscale revealed significant main effects of time, with both MBSR and PMR groups showing increases in self-reported levels of self-kindness when analyzed using pre- to post-intervention data, $F(1, 23) = 12.93$, $p = .002$, in analysis that included 8-week post-intervention data, $F(2, 42) = 9.00$, $p = .001$, and in analysis that also included 6-month post-intervention data, $F(3, 60) = 5.29$, $p = .003$.

In linear mixed-effects analysis of the Mindfulness subscale that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time, $F(4, 76) = 3.30$, $p = .015$, but no significant group main effect or group by time interaction effect (see Figure 3.6). In tests of within-subject contrasts, there was a significant linear main effect of time, $F(1, 19) = 8.21$, $p = .01$.

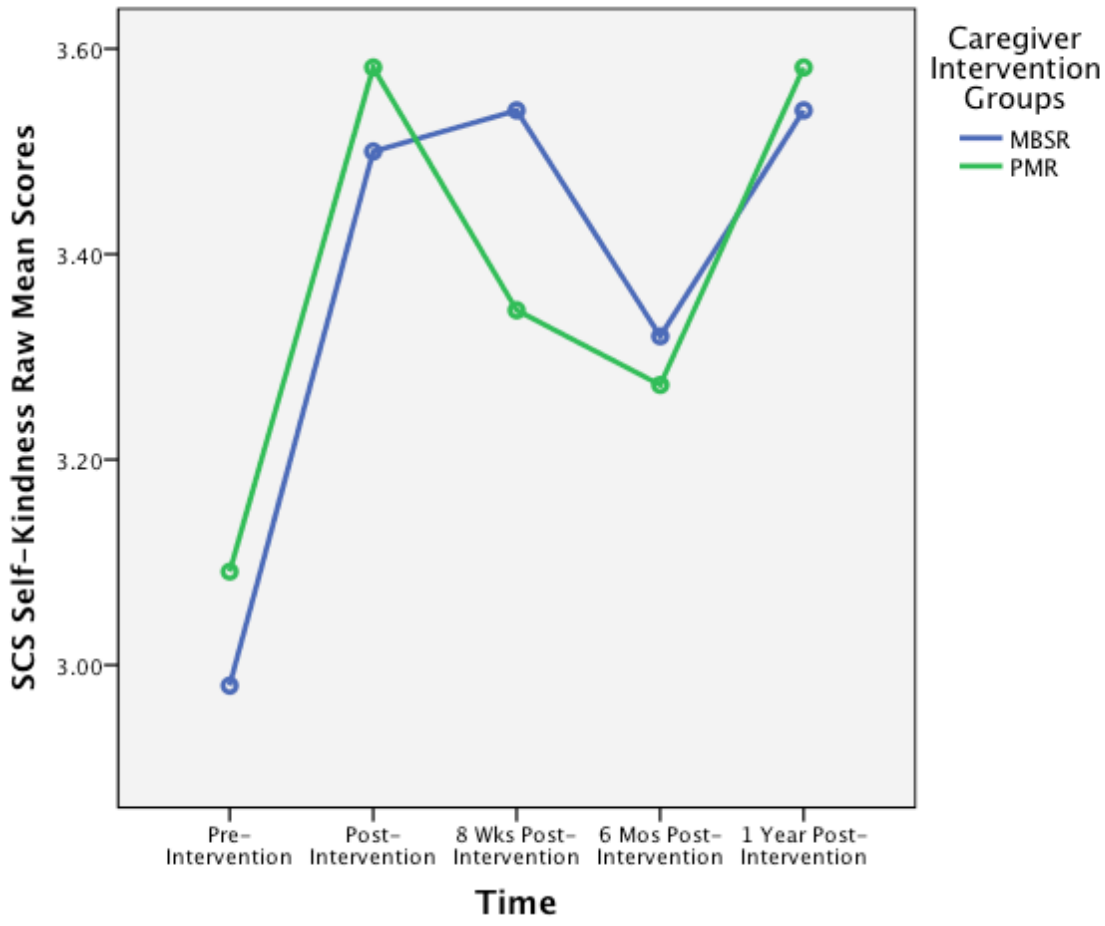


Figure 3.5 Self-Kindness Subscale of the Self-Compassion Scale (SCS) total mean scores over five assessments. This line graph shows differences by group of perceived levels of self-kindness at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the apparent interactions from post-intervention to 8 weeks post-intervention, and from 6 months post-intervention to 1 year post-intervention are not significant.

Linear mixed-effects analyses of variance of the SCS Mindfulness subscale also revealed significant main effects of time, with both MBSR and PMR groups showing increases in self-reported levels of mindfulness when analyzed using pre- to post-intervention data, $F(1, 23) = 7.71$, $p = .01$, in analysis that included 8-week post-intervention data,

$F(2, 42) = 5.11$, $p = .01$, and in analysis that also included 6-month post-intervention data, $F(3, 60) = 3.93$, $p = .01$.

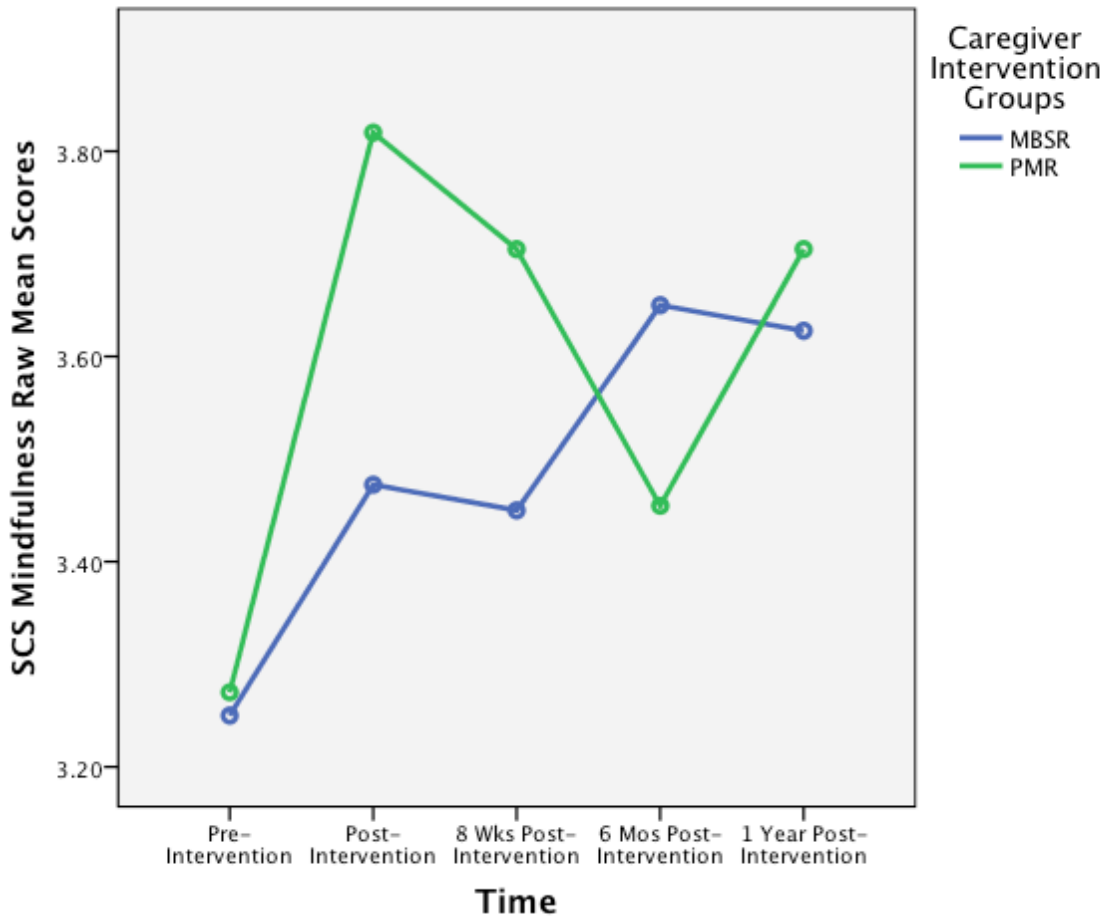


Figure 3.6 Mindfulness Subscale of the Self-Compassion Scale (SCS) total mean scores over five assessments. This line graph shows differences by group of perceived levels of mindfulness at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the apparent interactions from 8 weeks post-intervention to 6 months post-intervention, and from 6 months post-intervention to 1 year post-intervention are not significant.

In linear mixed-effects analysis of the Isolation subscale that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was no significant main effect of time, no significant group main effect or group by time

interaction effect. Linear mixed-effects analysis of the SCS Isolation subscale when analyzed using pre- and post-intervention, 8-week and 6-month post-intervention data, revealed a main effect of time that approached significance $F(3, 60) = 2.54$, $p = .065$. Further analysis of within-subjects contrast showed a significant cubic main effect of time, $F(1, 20) = 9.29$, $p = .006$. However, a group by time interaction was significant for the SCS Isolation subscale analysis that included pre-intervention, post-intervention and 8-week post-intervention data, $F(2, 42) = 3.85$, $p = .03$ (see Figure 3.7). While both MBSR and PMR groups reduced their levels of perceived isolation from pre- to post-intervention, the MBSR group maintained a significant pre-intervention to 8-week follow-up assessment decrease, while the PMR group did not. Linear mixed-effects analysis 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, $F(2, 42) = 4.27$, $p = .02$. Further analysis of within-subjects contrasts at pre-intervention, post-intervention and 8-week post-intervention data revealed a significant quadratic main effect of time, $F(1, 20) = 10.30$, $p = .004$.

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. 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 comparison for the PMR group showed a significant increase from post-intervention to 8 weeks post-intervention ($p = .01$).

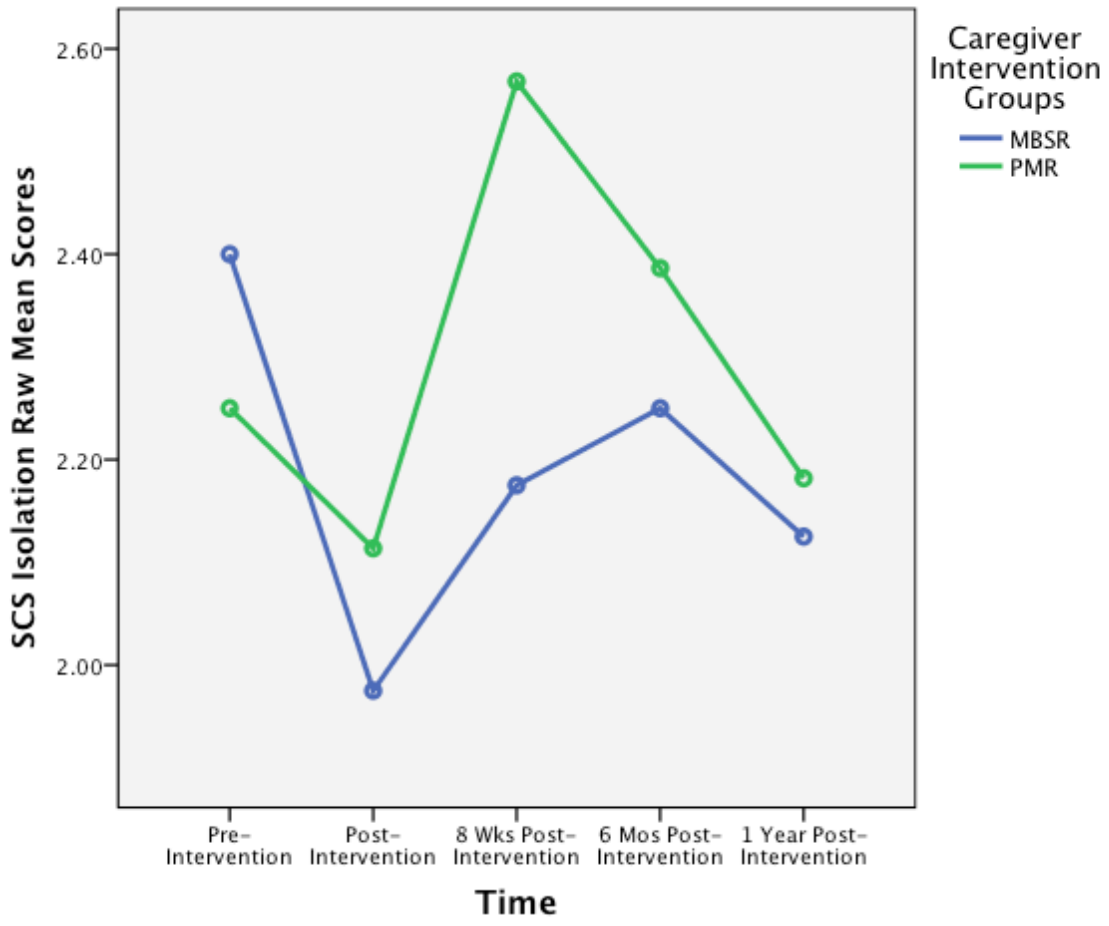


Figure 3.7 Isolation Subscale of the Self-Compassion Scale (SCS) total mean scores over five assessments. This line graph shows differences by group of perceived levels of isolation at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the apparent interaction from pre-intervention to post-intervention is not significant, however, there is a significant group by time interaction from pre-intervention to 8 weeks post-intervention.

In linear mixed-effects analysis of the Self-Judgment subscale that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time, $F(4, 76) = 2.51$, $p = .05$, but no significant group main effect or group by time interaction effect (see Figure 3.8). In tests of within-subject

contrasts, there was a significant linear main effect of time, $F(1, 19) = 6.99$, $p = .02$, and also a significant order 4 group by time interaction, $F(1, 19) = 6.73$, $p = .02$.

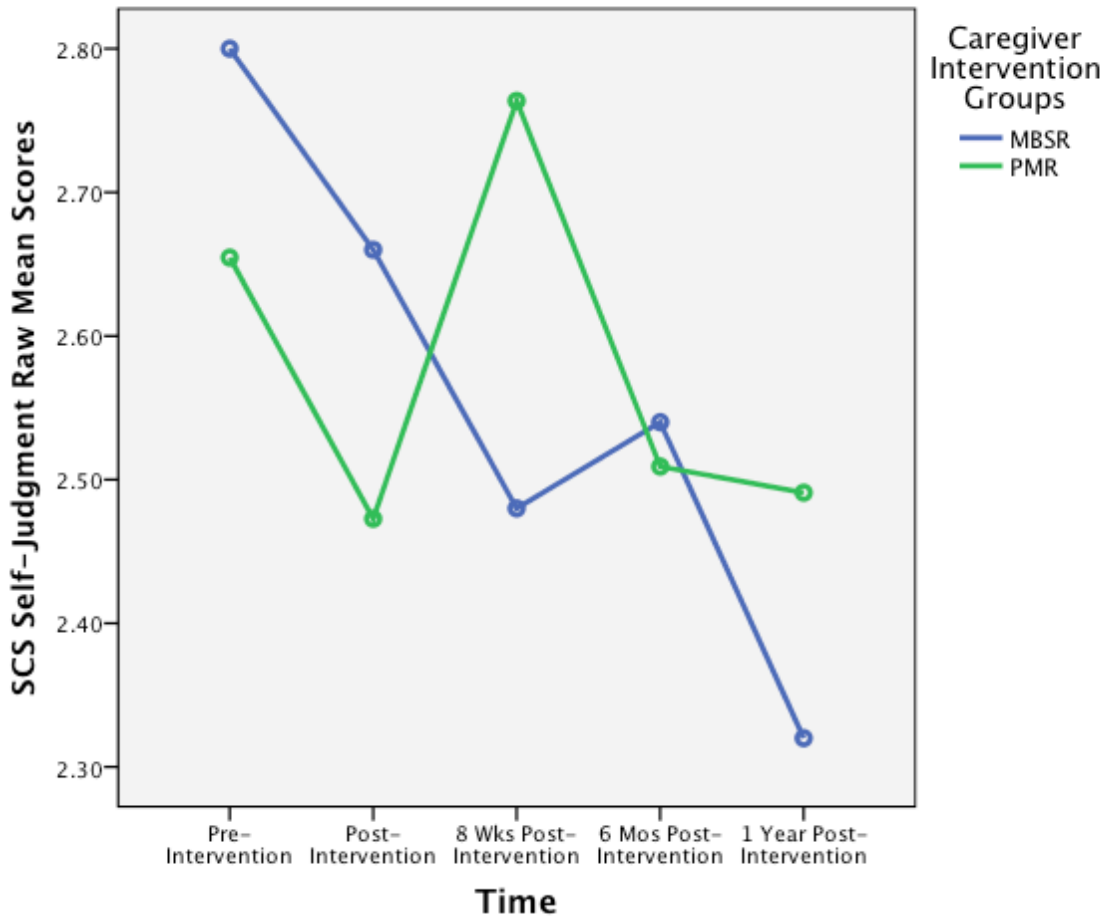


Figure 3.8 Self-Judgment Subscale of the Self-Compassion Scale (SCS) total mean scores over five assessments. This line graph shows differences by group of perceived levels of self-judgment at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the apparent interactions from post-intervention to 8 weeks post-intervention, from 8 weeks post-intervention to 6 months post-intervention, and from 6 months post-intervention to 1 year post-intervention are not significant.

In linear mixed-effects analysis of the Over-Identified subscale that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time, $F(4, 76) = 5.70$, $p < .001$, but no significant group main

effect or group by time interaction effect (see Figure 3.9). In tests of within-subject contrasts, there was a significant linear main effect of time, $F(1, 19) = 26.97$, $p < .001$, and also a cubic main effect of time that approached significance, $F(1, 19) = 4.17$, $p = .055$. Linear mixed-effects analyses of variance revealed significant main effects of time, with both MBSR and PMR groups showing decreases in self-reported levels of

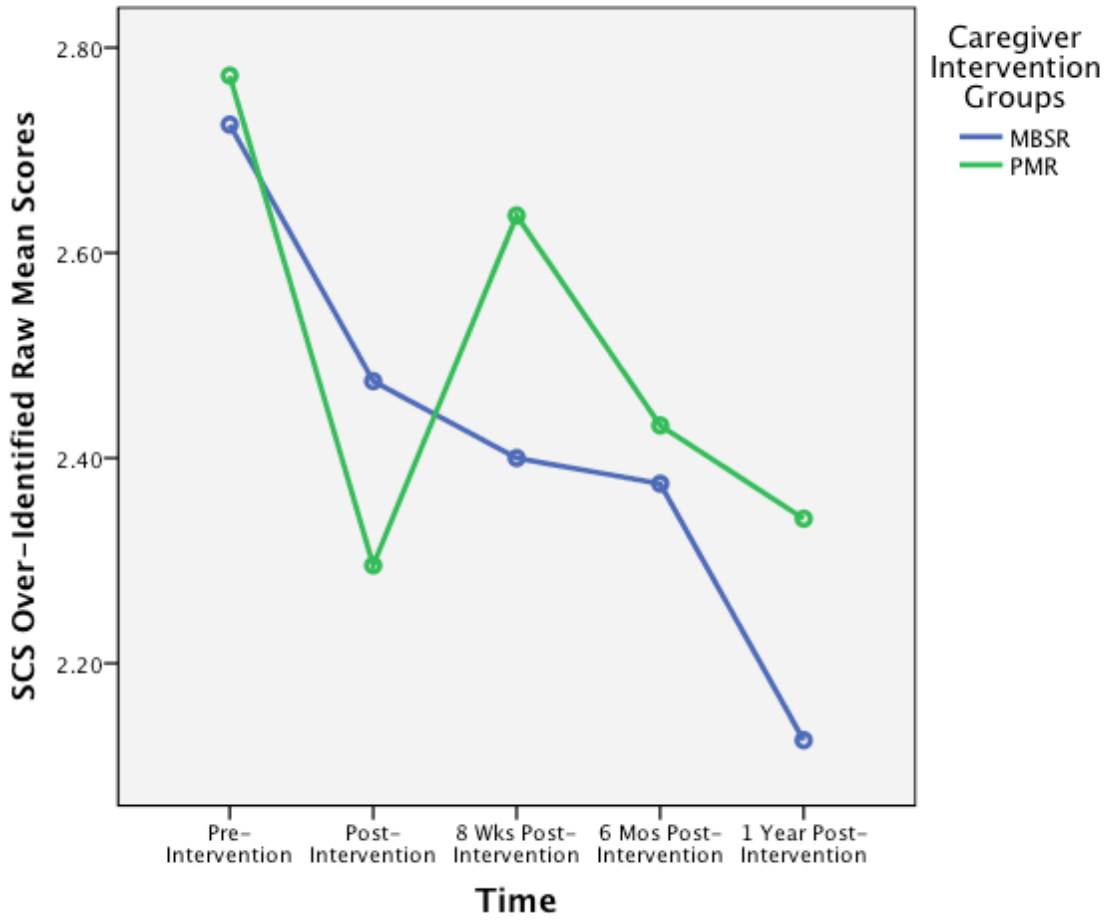


Figure 3.9 Over-Identified Subscale of the Self-Compassion Scale (SCS) total mean scores over five assessments. This line graph shows differences by group of perceived levels of over-identification with negative thoughts and emotions at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the apparent interactions from pre-intervention to post-intervention, and from post-intervention to 8 weeks post-intervention are not significant.

over-identification when analyzed using pre- to post-intervention data, $F(1, 23) = 6.51$, $p = .02$, in analysis that included 8-week post-intervention data, $F(2, 42) = 5.37$, $p = .008$, and in analysis that also included 6-month post-intervention data, $F(3, 60) = 4.87$, $p = .004$. Further within-subjects contrasts using pre-intervention, post-intervention, and 8-week post-intervention data revealed a significant quadratic main effect of time, $F(1, 21) = 7.18$, $p = .02$. Within-subjects contrasts using pre-intervention, post-intervention, 8-week post-intervention and 6-month post-intervention data also revealed a significant linear main effect of time, $F(1, 20) = 8.01$, $p = .01$ and a significant cubic main effect of time, $F(1, 20) = 6.80$, $p = .02$.

Self-Reported Levels of Dispositional Mindfulness

An independent samples *t*-test showed no differences between the groups on MAAS scores at pre-intervention, $t(23) = -.28$, $p = .78$, *ns*. In linear mixed-effects analysis that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time, $F(4, 76) = 3.97$, $p = .006$, but no significant group main effect or group by time interaction effect (see Figure 3.10). However, Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated, $\chi^2(9) = 28.78$, $p = .001$. The Greenhouse-Geisser correction ($\varepsilon = .52$) remains significant, $F(2.094, 39.78) = 3.97$, $p = .03$. In tests of within-subjects contrasts, there were significant cubic, $F(1, 19) = 8.44$, $p = .009$, and 4th order, $F(1,19) = 7.11$, $p = .015$, main effects of time.

General linear mixed-effects analyses of variance revealed significant main effects of time, with both MBSR and PMR groups showing increases in self-reported dispositional mindfulness when analyzed using pre- to post-intervention data,

$F(1, 23) = 11.08$, $p = .003$, in analysis that included 8-week post-intervention data, $F(2, 42) = 7.44$, $p = .002$, in analysis that also included 6-month post-intervention data, $F(3, 60) = 4.75$, $p = .005$. However, Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated at 8 weeks post-intervention, $\chi^2(2) = 14.102$, $p = .001$, and at 6 months post-intervention, $\chi^2(5) = 23.58$, $p < .001$.

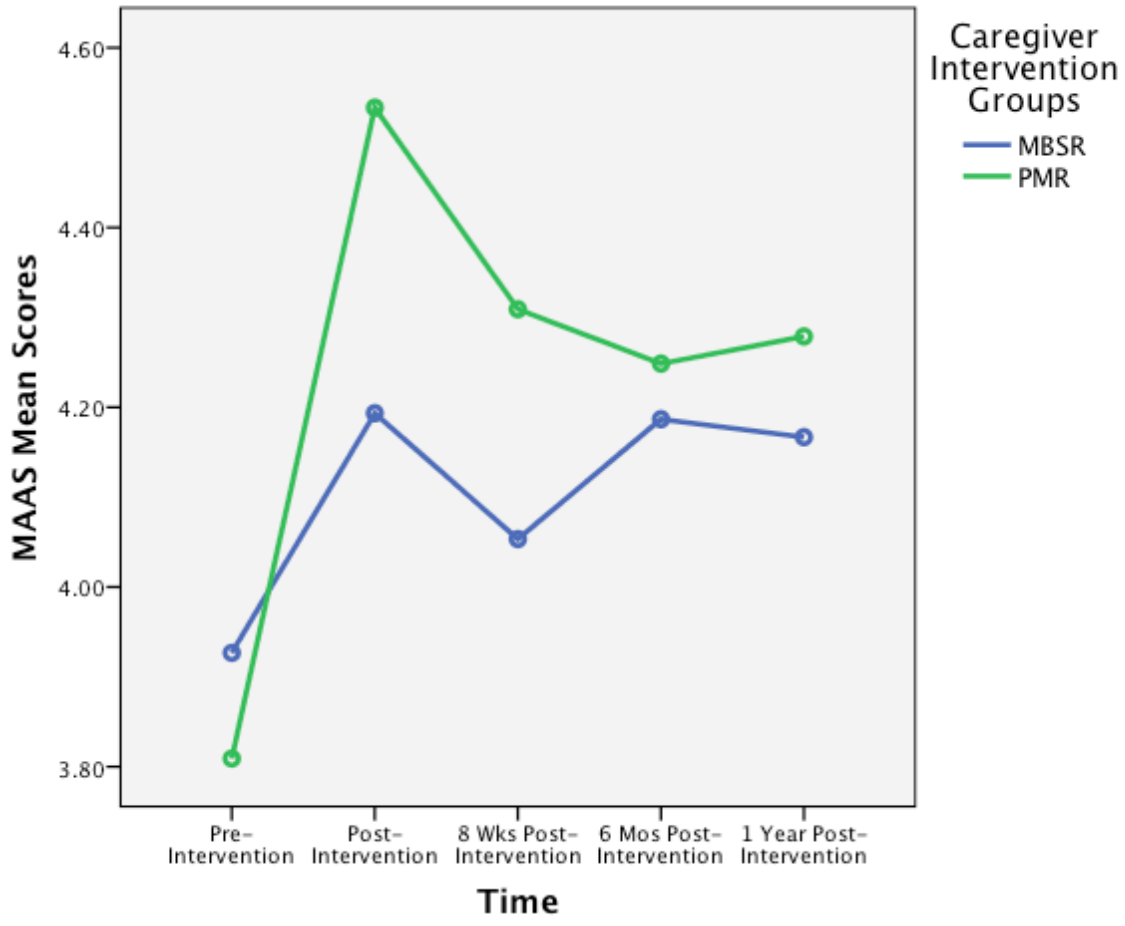


Figure 3.10 Mindful Attention Awareness Scale (MAAS) raw mean scores over five assessments. This line graph shows differences by group of observed levels of dispositional mindfulness at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the apparent interaction from pre-intervention to post-intervention is not significant.

The Greenhouse-Geisser correction at 8 weeks post-intervention (ε = .66) remains significant, $F(1.328, 27.89) = 7.44$, $p = .007$, as does the Greenhouse-Geisser correction at 6 months post-intervention (ε = .57), $F(1.694, 33.87) = 4.75$, $p = .02$. Further within-subjects contrasts using pre-intervention, post-intervention, and 8-week post-intervention data revealed a significant quadratic main effect of time, $F(1, 21) = 16.46$, $p = .001$, and a quadratic group by time interaction effect that approached significance, $F(1, 21) = 3.69$, $p = .068$, *ns*. Further within-subjects analysis using pre-intervention, post-intervention, 8-week post-intervention and 6-month post-intervention data revealed significant cubic, $F(1, 20) = 12.14$, $p = .002$, and quadratic, $F(1, 20) = 7.16$, $p = .015$, main effects of time, and a quadratic group by time interaction that approached significance, $F(1, 20) = 4.09$, $p = .057$, *ns*.

Self-Reported Levels of Perceived Loneliness

The Revised UCLA Loneliness Scale consists of 20 items measuring general feelings of loneliness. It provides a single total scale score comprised of the sum of 20 items, 10 of which are negatively worded, and 10 that are positively worded and require reverse scoring. Total scale scores range from 20 to 80, with higher scores indicating higher levels of perceived loneliness. Throughout the study, participant scores ranged from 22 to 70, with mean scores ranging from 37 to 39. The data were natural log–transformed to normalize distributions. An independent samples *t*-test showed no differences between the groups on baseline loneliness scores at pre-intervention, $t(23) = -1.37$, $p = .18$, *ns*. In linear mixed-effects analysis of perceived levels of loneliness that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was no significant main effect of time,

$F(4, 76) = 0.782$, $p = .54$, *ns,* no significant group main effect, $F(1, 19) = 0.003$, $p = .96$, *ns,* and no significant group by time interaction, $F(4, 76) = 1.44$, $p = .23$, *ns*. Linear mixed-effects analysis also showed no significant main effects of time or group and no significant group by time interaction at any assessment, indicating that there were no changes in perceived loneliness over time for either the MBSR or the PMR groups.

Secondary Outcome Variables

Self-Reported Emotional Reactivity to Patient Problem Behaviors

The Revised Memory and Behavior Problems Checklist (RMBPC) is a 24-item scale that assesses the frequency of patient problem behaviors and the caregiver's reaction to those behaviors. The frequency component of the scale has three subscales: Memory-related problems, depression-related problems and disruptive behavior problems. Since the data for the Disruption subscale were positively skewed, data analyses were conducted using natural log–transformed data. Independent samples *t*-tests showed no differences between the groups on RMBPC subscale scores or total mean scores at pre-intervention: Memory Problems subscale $t(23) = –.37$, $p = .71$, *ns*; Depression subscale $t(22) = –1.56$, $p = .14$, *ns*; Disruption LogN subscale $t(23) = –.70$, $p = .49$, *ns*; Total Mean Frequency $t(23) = –1.26$, $p = .22$, *ns*; and Total Mean Reaction $t(23) = –.18$, $p = .86$, *ns*. In linear mixed-effects analysis of the frequency of behavior problems that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was no significant main effect of time, $F(4, 76) = 0.78$, $p = .99$, *ns,* no significant group main effect, $F(1, 16) = 3.05$, $p = .10$, *ns,* and no significant group by time interaction, $F(4, 64) = 1.73$, $p = .15$, *ns.* Tests of within-subject

contrasts were also non-significant. There was a significant main effect of group in linear mixed-effects analysis of variance that included pre- to post-intervention and 8 weeks post-intervention data, $F(1, 18) = 5.54$, $p = .03$, and in analysis that also included 6-month post-intervention data, $F(1, 16) = 5.37$, $p = .03$, indicating that the total mean frequency of behavior problems differed significantly between the MBSR and PMR groups during the third (8 weeks post-intervention) and fourth assessments (6 months post-intervention). Linear mixed-effects analysis showed no significant main effects of time or group by time interaction effects in analyses that included pre- and post-intervention, 8-week post-intervention, and 6-month post-intervention data. Tests of within-subject contrasts were also non-significant in analyses that included pre- and post-intervention, 8-week post-intervention, and 6-month post-intervention data.

In addition to the frequency total mean score, the RMBPC has three subscales, Memory Problems, Depression, and Disruption. As noted above, independent samples *t*-tests showed no differences between the groups on any of the three subscales at pre-intervention. In linear mixed-effects analysis of the Memory Problems subscale that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was no significant main effect of time, no significant group main effect or group by time interaction effect. Linear mixed-effects analysis also showed no significant main effects of time or group and no significant group by time interaction at any assessment, indicating that there were no significant changes in reported patient memory problems over time for either the MBSR or the PMR groups. In linear mixed-effects analysis of the Depression subscale that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was no significant main effect of time, no significant

group main effect or group by time interaction effect. Linear mixed-effects analysis of the Depression subscale showed no significant main effects of time, no significant group main effects or group by time interaction effects in analyses that included pre- and post-intervention, 8-week post-intervention, and 6-month post-intervention data, indicating that there were no significant changes in reported symptoms of depression for the care recipients over time for either the MBSR or the PMR groups. In linear mixed-effects analysis of the natural–log transformed Disruption subscale that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant group by time interaction effect, $F(4, 64) = 3.60$, $p = .01$, but no significant main effect of time or group main effect. However, Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated, $\chi^2(9) = 18.84$, $p = .03$. The Greenhouse-Geisser correction ($\varepsilon = .63$) remains significant, $F(2.531, 40.49) = 3.60$, $p = .03$. In tests of within-subject contrasts, there was a significant quadratic group by time interaction, $F(1, 16) = 15.92$, $p = .001$. Reported disruptive symptom reduction was greater for the PMR group (see Figure 3.11). The pairwise comparison between the groups approached significant at 8 weeks post-intervention ($p = .053$). For the MBSR group, the pairwise comparison was significant from 6 months post-intervention to 1 year post-intervention ($p = .04$). Linear mixed-effects analysis of variance that included pre- to post-intervention and 8 weeks post-intervention data revealed a main effect of group that approached significance, $F(1, 18) = 3.70$, $p = .070$, *ns,* and in analysis that also included 6-month post-intervention data the main effect of group also approached significance, $F(1, 16) = 4.24$, $p = .056$, *ns,* indicating a difference in the frequency of disruptive behaviors between the MBSR and PMR groups during the third (8 weeks

post-intervention) and fourth assessments (6 months post-intervention). Linear mixed-effects analysis showed no significant main effects of time or group by time interaction effects in analyses that included pre- and post-intervention, 8-week post-intervention, and 6-month post-intervention data.

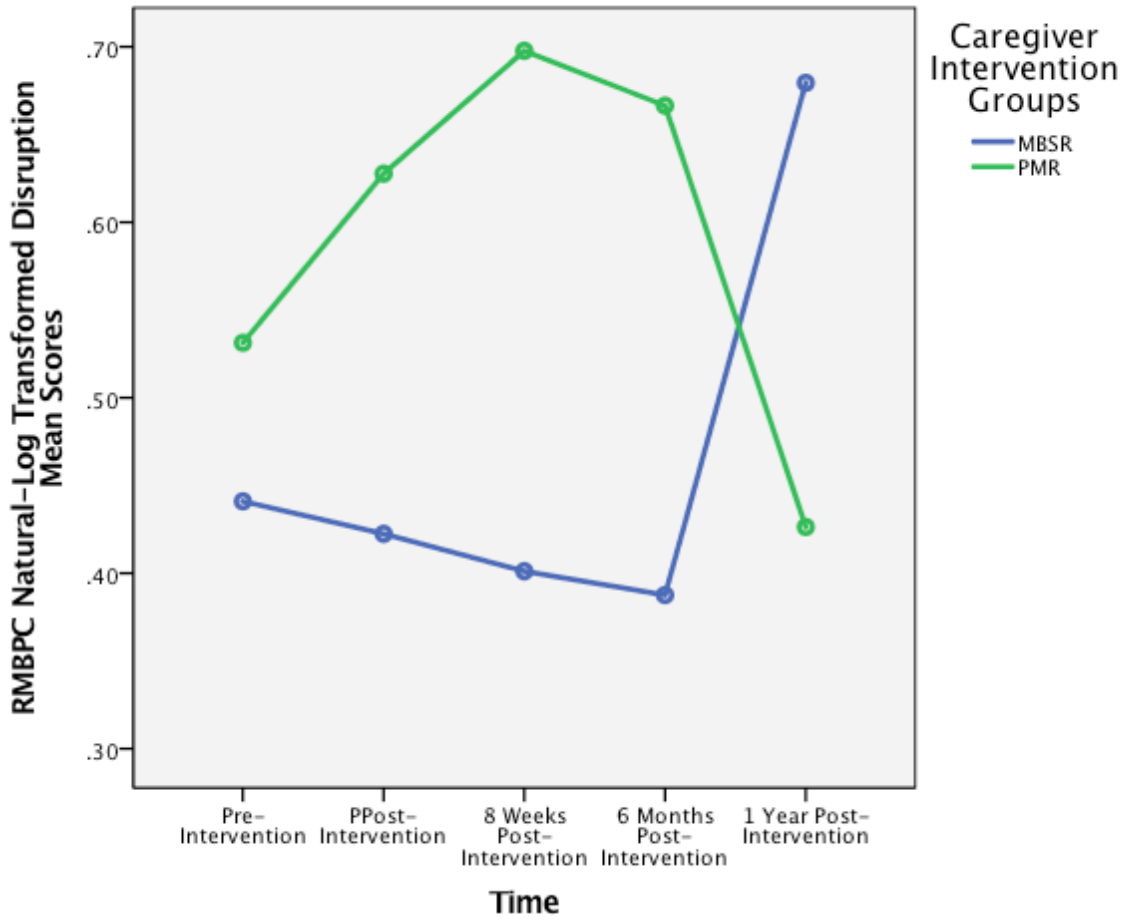


Figure 3.11 Revised Memory and Behavior Problems Checklist (RMBPC) natural–log transformed Disruption mean scores over five assessments. This line graph shows differences by group of reported levels of disruptive behaviors at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the interaction from 6 months post-intervention to 1 year post-intervention is significant.

Regarding the RMBPC Total Mean Reaction score, which assesses the caregiver's emotional reactivity to patient behaviors, linear mixed-effects analysis that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, showed a significant main effect of time $F(4, 56) = 2.57$, $p = .048$, a group by time interaction effect that approached significance $F(4, 56) = 2.20$, $p = .08$, *ns*, and a main effect of group that approached significance $F(1, 14) = 3.50$, $p = .08$, *ns* (see Figure 3.12). In tests of within-subject contrasts, there was a significant 4th order interaction $F(1, 14) = 4.68$, $p = .048$, and a main effect of time that approached both quadratic significance $F(1, 14) = 3.92$, $p = .068$, *ns*, and 4th order significance $F(1, 14) = 3.45$, $p = .085$, *ns*. These results indicate that self-reported emotional reactivity decreased for MBSR and PMR groups over time, that emotional reactivity was nominally but not significantly greater for the PMR group, and that symptom reduction was nominally but not significantly greater for the PMR group. Pairwise comparisons between the MBSR and PMR groups were significant at post-intervention ($p = .006$) and approached significance at 6 months post-intervention ($p = .057$). For the MBSR group, the pairwise comparison was significant from post-intervention to 8 weeks post-intervention ($p = .02$), and approached significance from 8 weeks post-intervention to 6 months post-intervention ($p = .066$). The pairwise comparison for the PMR group was significant from post-intervention to 1 year post-intervention ($p = .01$), and approached significance from 8 weeks post-intervention to 1 year post-intervention ($p = .055$).

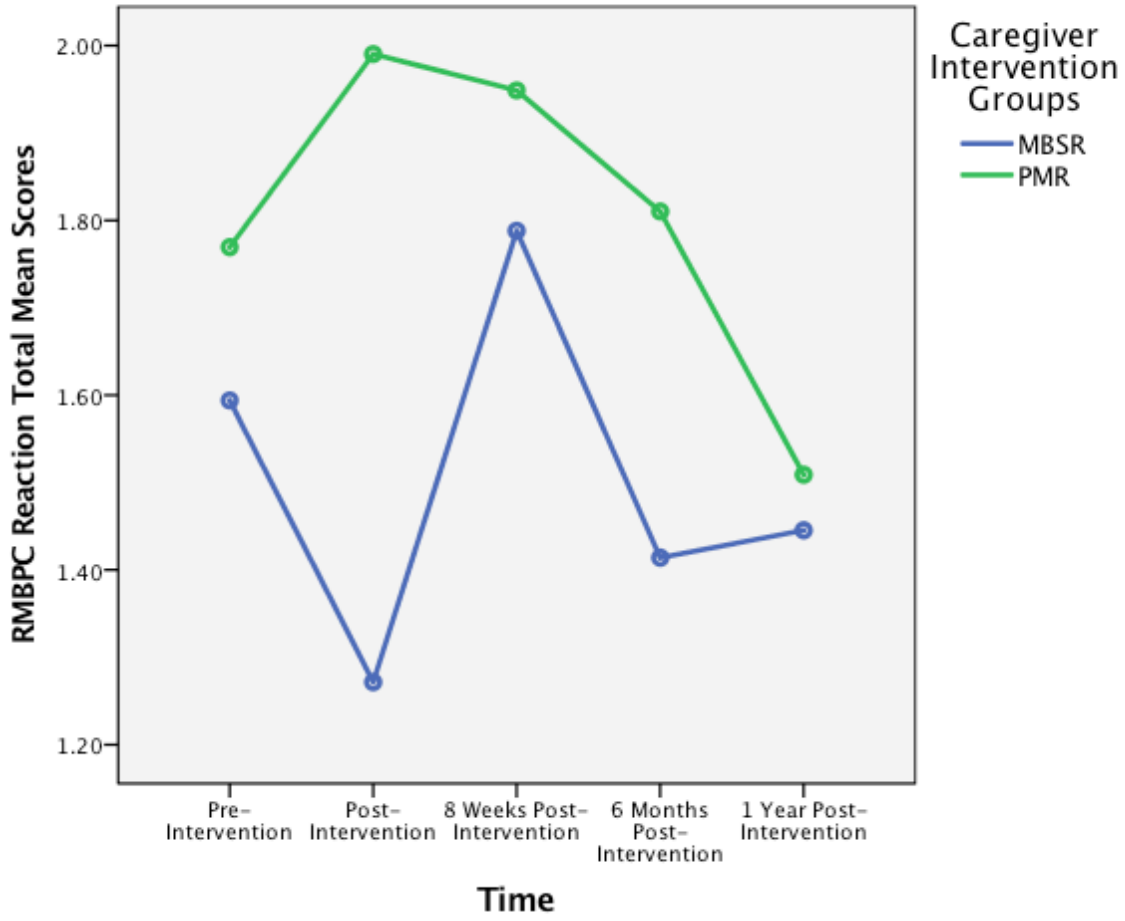


Figure 3.12 Revised Memory and Behavior Problems Checklist (RMBPC) Reaction mean scores over five assessments. This line graph shows differences by group of caregivers' emotional reactions to patient problem behaviors at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention.

In linear mixed-effects analysis that included pre- and post-intervention, and 8-week post-intervention data, there was a significant group by time interaction, $F(2, 34) = 3.96$, $p = .03$, but no main effect of time or group main effect. Further within-subjects contrasts using pre-intervention, post-intervention, and 8-week post-intervention data revealed a significant quadratic group by time interaction, $F(1, 17) = 6.71$, $p = .019$. Pairwise comparison between the MBSR and PMR groups was

significant at post-intervention (p = .009). For the MBSR group, the pairwise comparisons were significant from post-intervention to 8 weeks post-intervention (p = .02), and approached significance from pre-intervention to post-intervention (p = .06).

In linear mixed-effects analysis that included pre- and post-intervention, 8-week and 6-month post-intervention data, there was a significant main effect of group $F(1, 15) = 5.46$, $p = .03$, and a group by time interaction effect that approached significance $F(3, 45) = 2.35$, $p = .085$, *ns*. Further within-subjects contrasts using pre-intervention, post-intervention, 8-week and 6-month post-intervention data revealed a cubic group by time interaction effect that approached significance $F(1, 15) = 4.14$, $p = .06$, *ns*. The group by time interaction effects were not significant in linear mixed-effects analysis of the total mean reaction scores that included pre- and post-intervention data $F(1, 21) = 1.86$, $p = .19$, *ns*. Linear mixed-effects analyses of variance also revealed no significant main effects of time or group main effects in analyses that included pre- and post-intervention data.

Self-Reported Levels of Subjective Burden

The short version of the Zarit Burden Interview (ZBI) consists of 12 items measuring subjective burden of caregivers of cognitively impaired older adults. It provides a single total scale score comprised of the sum of 12 items. Total scale scores range from 0 to 48, with higher scores indicating higher levels of perceived burden. An independent samples t-test showed no differences between the groups on ZBI scores at pre-intervention, $t(21) = -.46$, $p = .65$, *ns*. In linear mixed-effects analysis that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there

were no significant main effects of time, $F(4, 64) = 1.24$, $p = .30$, *ns,* no significant group main effect, $F(1, 16) = 1.02$, $p = .33$, *ns,* and no significant group by time interaction, $F(4, 64) = 0.43$, $p = .79$, *ns*. Linear mixed-effects analysis also showed no significant main effects of time or group and no significant group by time interaction at any assessment. Results show no significant change in subjective levels of caregiving burden for both groups (see Figure 3.13).

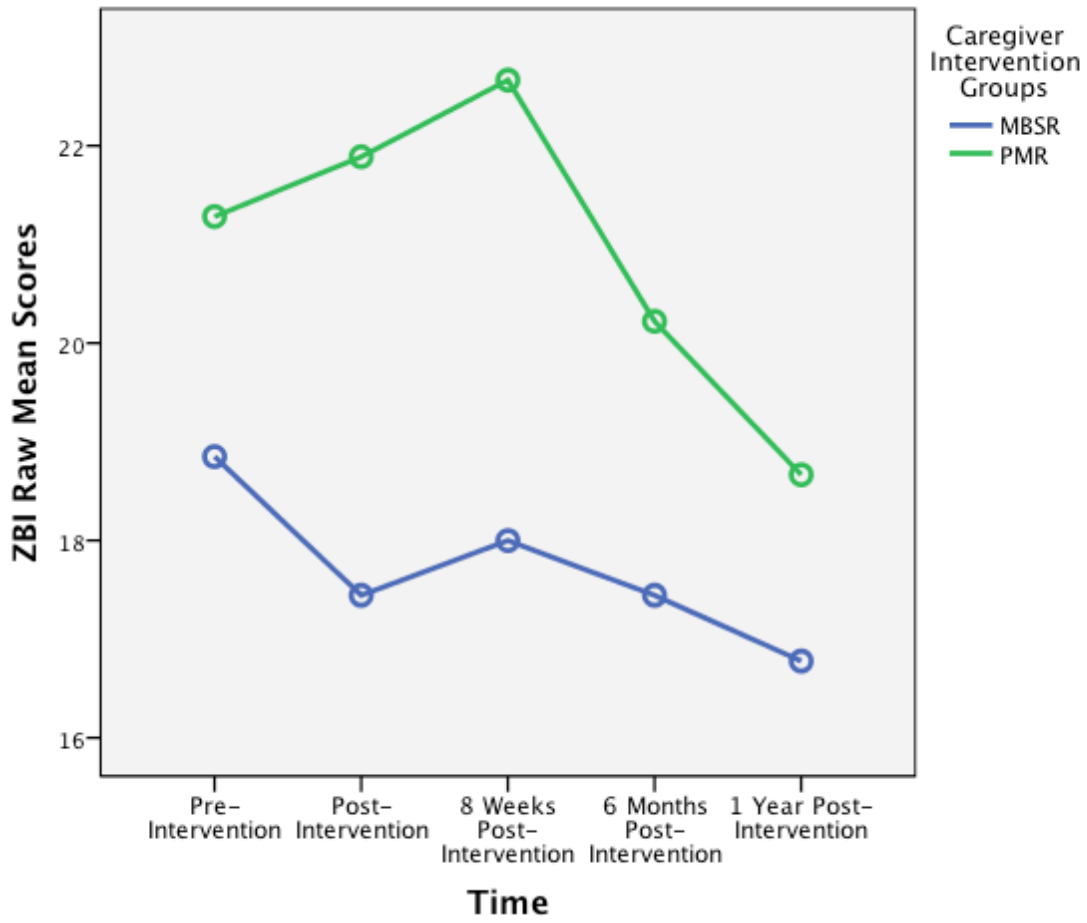


Figure 3.13 Zarit Burden Interview (ZBI) over five assessments. This line graph shows differences by group of perceived caregiver burden at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Note that the apparent decrease in scores for both groups across time is not significant.

The 12-item ZBI has a recommended cut score for identifying clinically significant levels of caregiver burden of 16/17 (Bédard et al., 2001), which was used in the present study to determine clinically meaningful levels of caregiver burden for the present sample of participants. Keeping in mind that the ZBI cut score is used as a screen for levels of burden and not for purposes of diagnostic classification, 16 participants (70 percent) met this cut-score criterion for symptoms indicative of high levels of burden at pre-intervention. At post-intervention and at 8 weeks post-intervention that number was unchanged, 16 participants continued to meet criteria for high levels of caregiver burden. At 6 months post-intervention, a total of 12 participants met criteria for high levels of caregiver burden, and at 1 year post-intervention, 12 participants (63 percent) again met criteria for high levels of caregiver burden. Further examination showed that caregivers with high levels of burden were evenly distributed across both groups, with 7 MBSR and 9 PMR participants reporting high levels of burden at pre-intervention, post-intervention and 8 weeks post-intervention. A total of 5 MBSR and 7 PMR participants reported high levels of caregiver burden at 6 months post-intervention and 1 year post-intervention. At the beginning of the study (pre-intervention), 70 percent of participants met criteria for high levels of caregiver burden using the short version of the ZBI (ZBI-12) scale. At the end of the study, approximately 14 months later, 63 percent of participants still met criteria for high levels of caregiver burden.

Self-Reported Sleep Quality

The Pittsburgh Sleep Quality Index (PSQI) assesses sleep quality and disturbances over a 1-month period. It provides a single global score comprised of the sum of 7 component scores. These component scores are derived from 19 individual

items on the 25-item instrument. Component scores include subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of medications to aid with sleep, and daytime dysfunction. An independent samples *t*-test showed no differences between the groups on PSQI global scores at pre-intervention, $t(23) = .49$, $p = .63$, *ns*. In linear mixed-effects analysis of sleep quality that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time $F(4, 92) = 2.58$, $p = .04$, but no significant group by time interaction and no significant main effect of group. In tests of within-subject contrasts, there was a significant linear interaction effect, $F(1, 23) = 5.60$, $p = .03$. Linear mixed-effects analysis of variance showed no significant main effects of time from pre-intervention to post-intervention, $F(1, 23) = 0.67$, $p = .42$, *ns,* in analysis that included 8 weeks post-intervention, $F(2, 46) = 2.68$, $p = .08$, *ns,* and in analysis that added 6 months post-intervention, $F(3, 69) = 1.94$, $p = .13$, *ns.* Group by time interaction effects and main effects of group were also non-significant from pre- to post-intervention, and at 8 weeks and 6 months post-intervention. Results show improvements in self-reported sleep quality over time for both groups (see Figure 3.14).

According to the authors, the PSQI is intended to be used as a simple screening measure to assess overall sleep quality and to distinguish between "good" and "poor" sleepers. A PSQI global score greater than 5 indicates poor sleep quality, and that "a subject is having severe difficulties in at least two areas, or moderate difficulties in more than three areas" (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989, p. 205). Keeping in mind that the PSQI is a screen for poor sleep quality and not for purposes of a

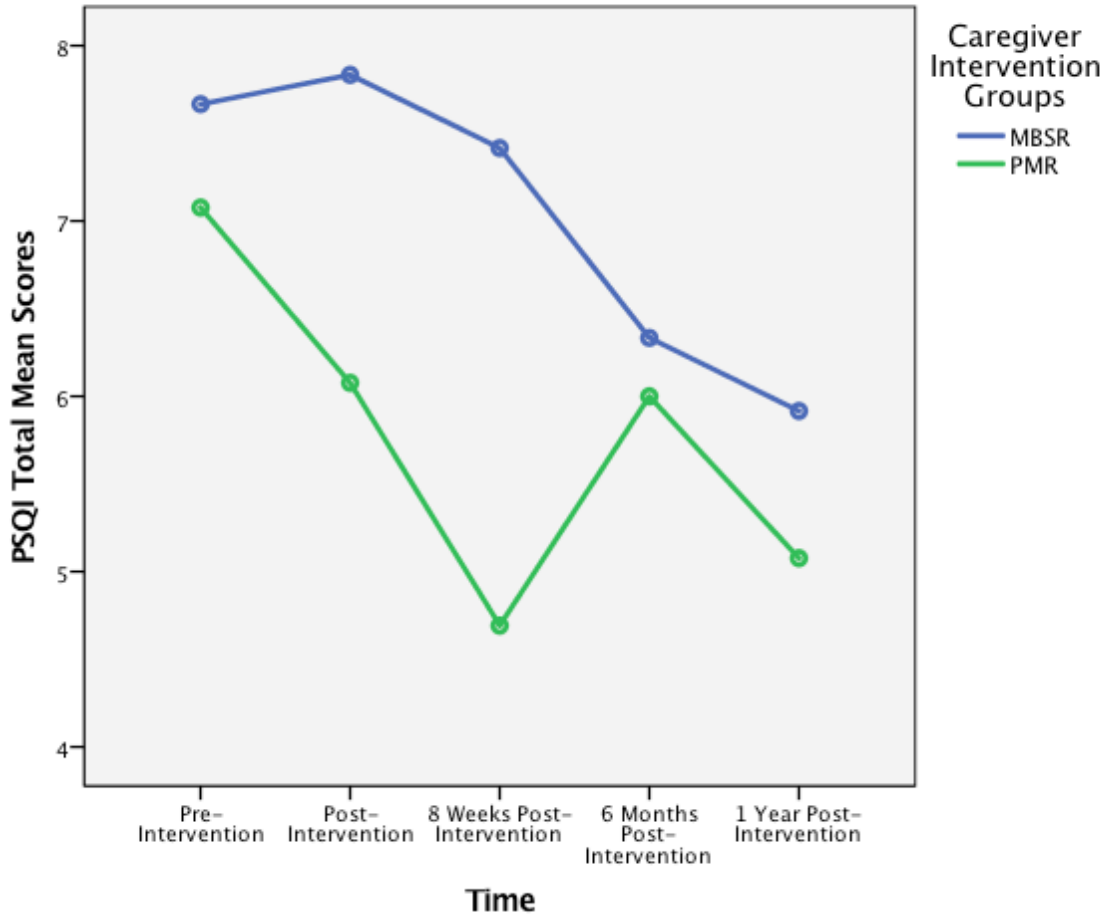


Figure 3.14 Pittsburgh Sleep Quality Index (PSQI) total mean scores over five assessments. This line graph shows differences by group of self-reported assessment of sleep quality at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention.

diagnostic classification, 19 participants (76 percent) met the criterion for poor sleep quality at pre-intervention. At post-intervention 16 participants (64 percent) met the criterion. At 8 weeks post-intervention, a total of 14 participants (56 percent) met the criterion for poor sleep quality. At 6 months post-intervention 13 participants (52 percent) met the criterion, and at 1 year post-intervention, 12 participants (48 percent) reported continued poor sleep quality. Further examination showed that the MBSR group had 11 participants and the PMR group had 8 participants who met the criterion for poor

sleep quality at pre-intervention. By the end of intervention training, both groups had 8 participants who met criteria for poor sleep quality. At the third assessment, 8 weeks after intervention training ended, the MBSR group had 10 participants with PSQI global scores indicating poor sleep quality and the PMR group had 4 participants who met criteria for poor sleep quality. By the fourth assessment, 6 months post-intervention, the MBSR group had 6 participants and the PMR group had 7 participants that met criteria for poor sleep quality, and by the final assessment 1 year post-intervention, the MBSR group had 7 participants with PSQI global scores indicating poor sleep quality, while the PMR group had 5 participants who met criteria for poor sleep quality. At the beginning of the study (pre-intervention), 76 percent of caregivers met criteria for poor sleep quality using the PSQI. At the end of the study, approximately 14 months later, only 48 percent of participants met criteria for poor sleep quality. While reductions were observed in both groups, the MBSR group showed a nominally greater reduction in the number of participants reporting poor sleep quality, reducing from a total of 11 participants who met criteria at pre-intervention to 7 by the end of the study.

Systolic Blood Pressure

Systolic blood pressure (SBP) was recorded at two-minute intervals four times before and four times after a laboratory controlled emotional stress test. These multiple readings were averaged for the recordings taken before, and the measurements 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). SBP data, measured in millimeters of mercury (mm/Hg), were natural log–transformed to normalize

distributions. Paired samples *t*-tests of natural log–transformed data 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 caregiver-specific emotional stress test, and 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, $t(20) = 4.73$, $p < .001$, at 8 weeks post-intervention, $t(19) = 2.89$, $p = .009$, at 6 months post-intervention, and $t(20) = 3.38$, $p = .003$, at 1 year post-intervention.

Significant differences between pre-stress test means and post-stress test means at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention confirmed the intended effect of the caregiver-specific emotional stress test in eliciting a physiological SBP response (see Table 3.3). An independent samples *t*-test showed no differences between the groups on resting SBP (mean 3 scores) at pre-intervention, $t(22) = –.56$, $p = .58$, *ns*. One participant was excluded from all blood pressure analyses due to difficulty in securing the blood pressure cuff. A general linear mixed-effects analysis of variance was used to analyze the systolic blood pressure data. Group and assessment (time) were modeled as fixed effects, while pre- to post-stress SBP was nested within assessment and modeled as a random effect. In linear mixed-effects analysis of SBP that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time $F(4, 64) = 7.42$, $p < .001$, and a significant main effect of pre- to-post stress SBP $F(1, 16) = 46.73$, $p < .001$, but no significant main effect of group.

Table 3.3

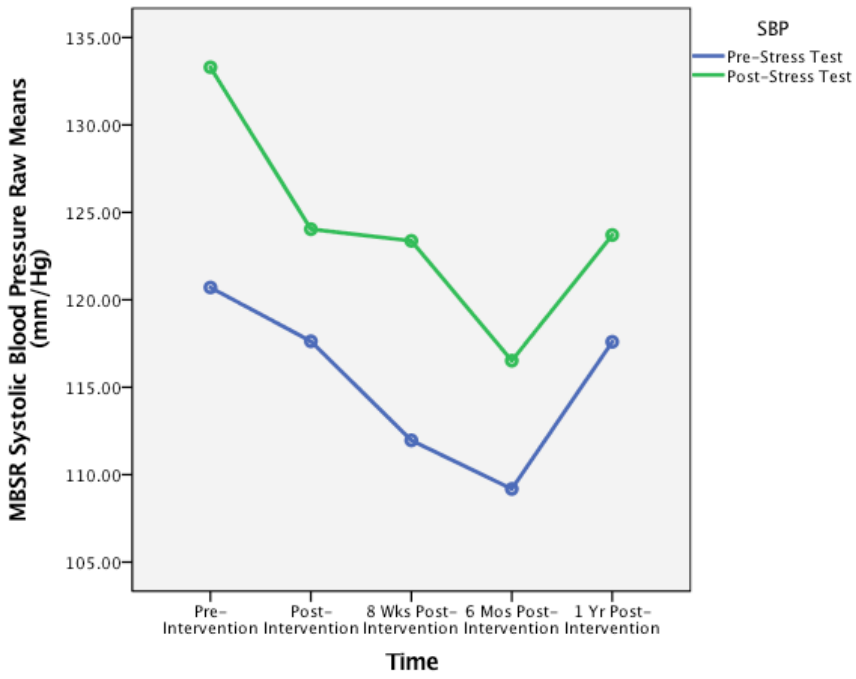
Systolic Blood Pressure Pre-Stress Test to Post-Stress Test (Mean 3) at Pre-Intervention, Post-Intervention, 8 Weeks Post-Intervention, 6 Months Post-Intervention, and 1 Year Post-Intervention

Both Groups*	N	Pre-Stress Raw Means (mm Hg)/SD	Post-Stress Raw Means (mm Hg)/SD	Pre-Stress (LogN)/SD	Post-Stress (LogN)/SD
Pre-Intervention	24	122 / 22	131 / 26	4.80 / 0.17	4.87 / 0.18
Post-Intervention	23	116 / 20	124 / 22	4.75 / 0.16	4.81 / 0.16
8 Weeks Post	21	109 / 17	119 / 20	4.69 / 0.15	4.78 / 0.16
6 Months Post	20	107 / 12	113 / 17	4.67 / 0.11	4.73 / 0.14
1 Year Post	20	114 / 20	120 / 24	4.73 / 0.16	4.78 / 0.18

* Participant #3 is excluded from these analyses.

The time by group interaction, the pre- to-post stress SBP by group interaction, the time by pre- to-post stress SBP interaction, and the time by pre- to-post stress SBP by group interaction were non-significant. In tests of within-subject contrasts, there were significant linear, $F(1, 16) = 15.30$, $p = .001$, and quadratic, $F(1, 16) = 13.21$, $p = .002$, main effects of time, and a significant linear main effect of pre- to-post stress SBP, $F(1, 16) = 46.73$, $p < .001$ (see Figure 3.15).

MBSR Systolic Blood Pressure Mean 3



PMR Systolic Blood Pressure Mean 3

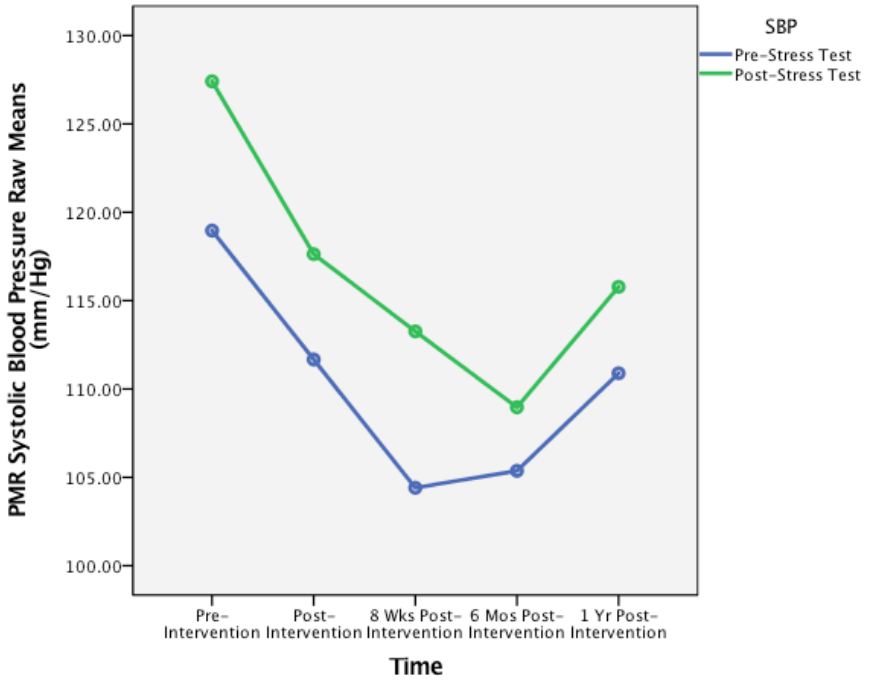


Figure 3.15 Pre-Stress Test to Post-Stress Test Systolic Blood Pressure (SBP) over five assessments. These line graphs emphasize increases by group of pre- to-post stress readings (mean of 3) as a result of a controlled laboratory stress test. Overall decreases in pre- to-post stress SBP readings are observed from pre-intervention to post-intervention, with additional decreases observed at 8 weeks post-intervention and 6 months post-intervention for both groups. At 1 year post-intervention, an increase in pre- to-post stress SBP readings is seen in both groups that remains below baseline.

Two-way and three-way interactions of time by pre- to-post stress SBP by group were not significant in linear mixed-effects analysis that included pre- to post-intervention data, in analyses that included 8-week post-intervention data, and in analyses that also included 6-month post-intervention data. Linear mixed-effects analysis of variance revealed significant main effects of time across all assessments, indicating that both MBSR and PMR groups showed decreases in SBP from pre-intervention to post-intervention, $F(1, 21) = 9.13$, $p = .006$, in analysis that included 8-week post-intervention data, $F(2, 38) = 10.99$, $p <. 001$, and in analysis that added 6-month post-intervention data, $F(3, 51) = 10.41$, $p <. 001$. Linear mixed-effects analysis of variance revealed significant main effects of pre- to post-stress SBP across all assessments, indicating that both MBSR and PMR groups showed intended stress-induced changes in pre- to post-stress SBP from pre-intervention to post-intervention, $F(1, 21) = 34.66$, $p < .001$, in analysis that included 8-week post-intervention data, $F(1, 19) = 39.33$, $p < .001$, and in analysis that added 6-month post-intervention data, $F(1, 17) = 55.88$, $p < .001$. Further within-subjects contrasts using pre- to post-intervention data revealed a significant linear main effect of time, $F(1, 21) = 9.13$, $p = .006$, in within-subjects contrasts that included 8-week post-intervention data there was a significant linear main effect of time, $F(1, 19) = 23.05$, $p < .001$, and in analyses that also included 6-month post-intervention data there was both a significant linear main effect of time, $F(1, 17) = 25.61$, $p < .001$, and a significant within-subjects contrast interaction effect of time (cubic) by pre- to post-stress SBP (linear), $F(1, 17) = 4.82$, $p < .04$.

Salivary Cortisol

Salivary cortisol samples were collected over the course of a day and also collected during a controlled laboratory experiment. For the diurnal saliva collection, four samples were collected: The first upon awakening, the second 30 minutes after awakening, the third at 4:00 p.m., and the final sample was collected at 9:00 p.m. These samples were collected on the same day, one or two days prior to each laboratory visit. During the laboratory assessment, three samples of saliva were collected: The first immediately after the end of the Mundane Events Recall task (MER), the second immediately after the end of the Caregiver-specific Mental Activation Task (CMAT—the emotional stress task), and the third sample was collected 21 minutes after the initiation of the emotional stressor of the CMAT. 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 percent. As expected, cortisol levels changed significantly throughout the day. However, cortisol levels also varied significantly between participants (see Table 3.4 for range of raw cortisol measurements over all assessments). 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 general linear mixed-effects analysis of

variance was used to analyze the diurnal cortisol data. Group and assessment (time) were modeled as fixed effects, while the diurnal cortisol was nested within assessment and modeled as a random effect.

Table 3.4

Range of Raw Diurnal Cortisol Levels at Pre-Intervention, Post-Intervention, 8 Weeks Post-Intervention, 6 Months Post-Intervention, and 1 Year Post-Intervention

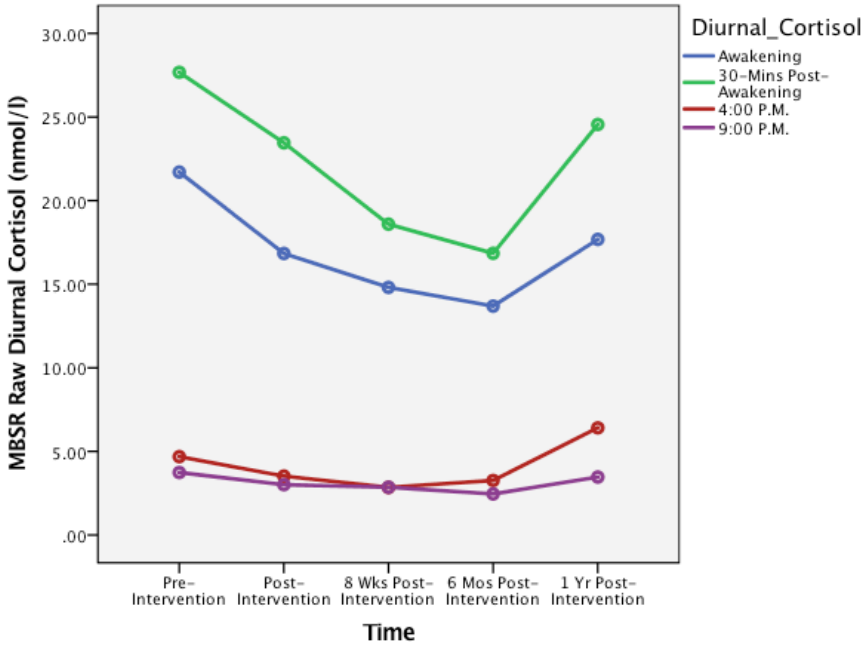
Both Groups	N	Awakening Cortisol (nmol/L)/SD	30 Mins Post-Awakening Cortisol (nmol/L)/SD	4:00 p.m. Cortisol (nmol/L)/SD	9:00 p.m. Cortisol (nmol/L)/SD
Pre-Intervention	24	4.9–49.9 / 9.8	12.5–65.7 / 11.9	2.1–18.1 / 3.5	0.8–14.6 / 3.0
Post-Intervention	23	4.3–61.2 / 13.1	5.9–77.5 / 15.3	1.6–11.5 / 2.5	0.6–9.1 / 2.1
8 Weeks Post	23	2.7–32.3 / 7.2	6.00–44.4 / 9.3	1.2–13.3 / 2.8	0.7–11.2 / 2.4
6 Months Post	23	4.7–54.3 / 11.1	8.5–41.3 / 9.8	1.5–13.1 / 2.5	0.6–6.8 / 1.7
1 Year Post	23	7.2–58.3 / 10.9	7.2–48.3 / 8.9	1.4–28.7 / 6.7	0.9–13.7 / 3.1

Consistent with the secondary hypothesis, a decrease in diurnal cortisol was observed for both MBSR and PMR groups over the assessments. In linear mixed-effects analysis of diurnal cortisol that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time $F(4, 68) = 6.51$, $p < .001$, and a significant main effect of diurnal cortisol $F(3, 51) = 163.51$, $p < .001$, but no significant main effect of group. The time by group interaction, the diurnal cortisol by group interaction, the time by diurnal cortisol interaction, and the time by diurnal cortisol by group interaction were non-significant. In tests of within-subject contrasts, there was a significant quadratic main effect of time, $F(1, 17) = 18.15$, $p = .001$, and significant linear

$F(1, 17) = 341.64$, $p < .001$, cubic $F(1, 17) = 75.30$, $p < .001$, and quadratic $F(1, 17) = 43.13$, $p < .001$, main effects for diurnal cortisol $F(1, 16) = 46.73$, $p < .001$ (see Figure 3.16).

Three-way interactions of time by diurnal cortisol by group were not significant in linear mixed-effects analyses at any time points. However, the interaction of diurnal cortisol by group was significant at 8 weeks post-intervention, $F(3, 57) = 3.36$, $p = .03$, and in analysis that included 6 months post-intervention, $F(3, 54) = 3.36$, $p = .03$. Linear mixed-effects analyses revealed a significant main effect of time across all assessments, with both MBSR and PMR groups showing decreases in diurnal cortisol when analyzed using pre- to post-intervention data, $F(1, 22) = 5.59$, $p = .03$, in analysis that included 8-week post-intervention data, $F(2, 38) = 10.47$, $p < .001$, and in analysis that also included 6-month post-intervention data, $F(3, 54) = 5.97$, $p = .001$. Similarly, linear mixed-effects analyses revealed a significant main effect of diurnal cortisol when analyzed using pre- to post-intervention data, $F(3, 66) = 192.42$, $p < .001$, in analysis that included 8-week post-intervention data, $F(3, 57) = 173.30$, $p < .001$, and in analysis that also included 6-month post-intervention data, $F(3, 54) = 180.62$, $p < .001$.

MBSR Diurnal Cortisol over Five Assessments



PMR Diurnal Cortisol over Five Assessments

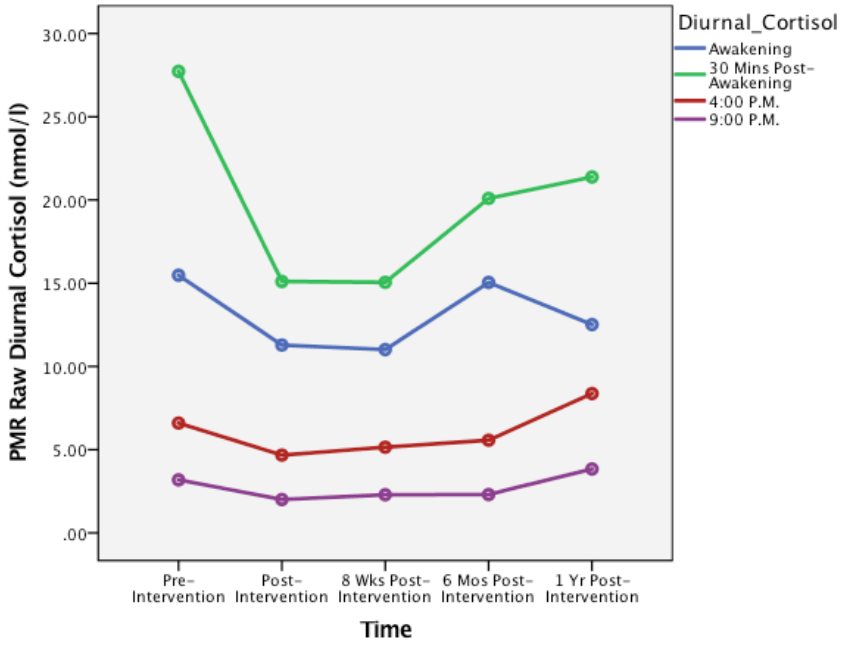


Figure 3.16 Diurnal cortisol (raw scores) over five assessments. These line graphs emphasize the normal pattern of diurnal cortisol characterized by increases from Awakening to 30 Minutes Post-Awakening, followed by progressive decreases in cortisol levels in the afternoon and evening. Overall decreases in Awakening to 30 Minutes Post-Awakening levels are observed for both groups from pre-intervention to post-intervention, with additional decreases observed at 8 weeks post-intervention and 6 months post-intervention for the MBSR group. At 1 year post-intervention, an increase in diurnal cortisol levels is seen in both groups.

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 (typically increase) in cortisol levels from the first to the second sample, which in this case is the 30 Minutes Post-Awakening sample. It must be noted however, that not all participants showed the expected increase from Awakening to 30 Minutes Post-Awakening. Some participants showed minimal or no increase in their cortisol levels and a few participants showed an opposite result (though not consistently), of a decrease in cortisol levels from the Awakening to the 30 Minutes Post-Awakening sample. As a result, CAR was computed as the positive difference of the change from the first to the second sample ((30 Minutes Post-Awakening – Awakening) + 20). Across all 5 assessments, from Awakening to 30 Minutes Post-Awakening, mean cortisol levels showed increases of 63–73 percent (see Table 3.5 for mean cortisol levels and mean increases from Awakening and 30 Minutes Post-Awakening).

A general linear mixed-effects analysis of variance was used to analyze the cortisol awakening response data. Group and assessment (time) were modeled as fixed effects, while the Awakening and 30 Minutes Post-Awakening cortisol were nested within assessment and modeled as a random effect. Cortisol data were natural log–transformed to normalize distributions. In linear mixed-effects analysis of cortisol response that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time $F(4, 72) = 5.45$, $p = .001$, and a significant main effect of cortisol response, $F(1, 18) = 21.42$, $p < .001$, but

Table 3.5

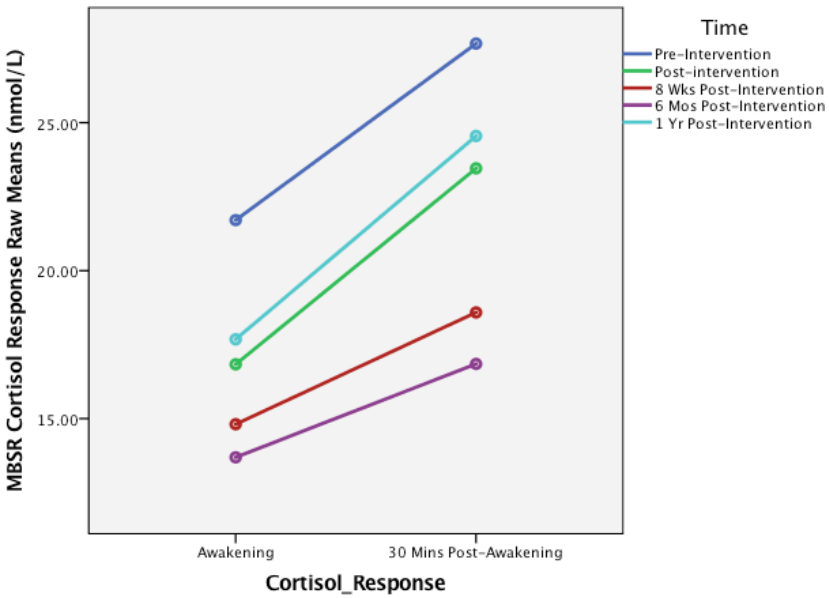
Raw Mean Cortisol Levels and Mean Positive Differences of Awakening to 30 Minutes Post-Awakening Cortisol at Pre-Intervention, Post-Intervention, 8 Weeks Post-Intervention, 6 Months Post-Intervention, and 1 Year Post-Intervention

Both Groups	N	Awakening Cortisol Means (nmol/L)/SD	30 Mins Post-Awakening Cortisol Means (nmol/L)/SD	Mean Positive Difference (Raw score + 20) (nmol/L)/SD	Mean Percent Change of Cortisol (%)
Pre-Intervention	24	18.0 / 9.8	27.6 / 11.9	29.6 / 7.9	71.9
Post-Intervention	23	15.7 / 13.1	21.2 / 15.3	25.5 / 6.9	63.1
8 Weeks Post	23	13.5 / 7.2	18.4 / 9.3	24.9 / 9.7	72.6
6 Months Post	23	15.0 / 11.1	19.5 / 9.8	24.5 / 10.1	65.5
1 Year Post	23	15.6 / 10.9	22.4 / 8.9	26.8 / 9.0	69.9

no significant main effect of group. The time by group interaction, the cortisol response by group interaction, the time by cortisol response interaction, and the time by cortisol response by group interaction were non-significant. In tests of within-subject contrasts, there was a significant quadratic, $F(1, 18) = 16.88$, $p = .001$, and significant linear, $F(1, 18) = 5.39$, $p = .03$, main effects of time (see Figure 3.17).

Three-way interactions of time by cortisol response by group were not significant in linear mixed-effects analyses at any time points. Two-way interactions were also non-significant at any time points. Linear mixed-effects analyses revealed a significant main effect of time across all assessments, with both MBSR and PMR groups showing decreases in the cortisol response when analyzed using pre- to post-intervention data,

MBSR Cortisol Response over Five Assessments



PMR Cortisol Response over Five Assessments

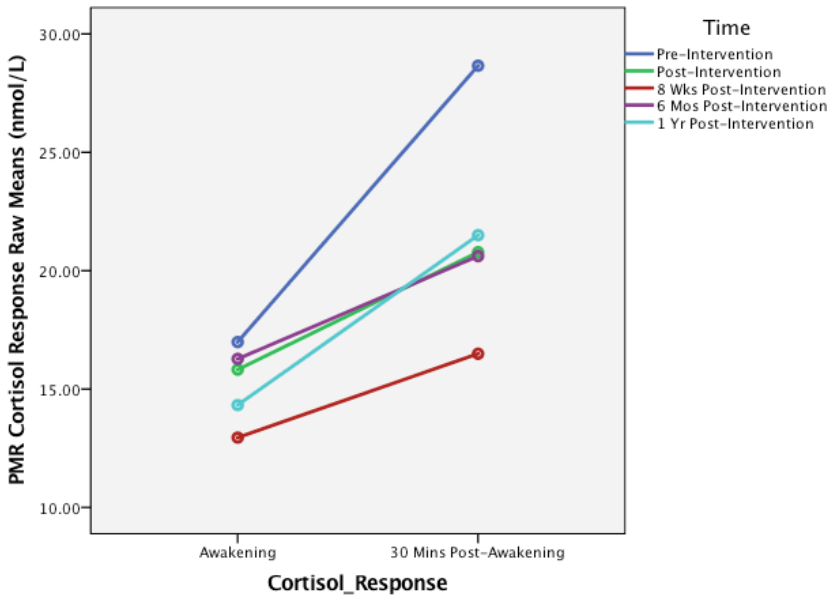


Figure 3.17 Cortisol Awakening Response (CAR raw scores) over five assessments. These line graphs emphasize the normal pattern of the cortisol awakening response characterized by increases from Awakening to 30 Minutes Post-Awakening. Overall decreases in Awakening to 30 Minutes Post-Awakening levels are observed for both groups from pre-intervention to post-intervention and 8 weeks post-intervention, with additional decreases observed at 6 months post-intervention for the MBSR group. At 1 year post-intervention, an increase in cortisol response levels is seen in both groups.

$F(1, 22) = 6.79$, $p = .02$, in analysis that included 8-week post-intervention data, $F(2, 40) = 9.24$, $p = .001$, and in analysis that also included 6-month post-intervention data, $F(3, 54) = 5.12$, $p = .003$. Similarly, linear mixed-effects analyses revealed a significant main effect of cortisol response when analyzed using pre- to post-intervention data, $F(1, 22) = 35.90$, $p < .001$, in analysis that included 8-week post-intervention data, $F(1, 20) = 25.17$, $p < .001$, and in analysis that also included 6-month post-intervention data, $F(1, 19) = 21.52$, $p < .001$.

Cortisol measures taken at Awakening, 4:00 p.m. and 9:00 p.m. (i.e., eliminating the 30 Minutes Post-Awakening cortisol peak) were averaged to compute Daily Average Cortisol (DAC). DAC data were natural log–transformed to normalize distributions. An independent samples *t*-test showed no differences between the groups on DAC scores at pre-intervention, $t(22) = .34$, $p = .74$, *ns*. In linear mixed-effects analysis of DAC that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time $F(4, 72) = 3.29$, $p = .02$, but no significant main effect of group. The time by group interaction was non-significant. In tests of within-subject contrasts, there was a significant quadratic main effect of time, $F(1, 18) = 11.99$, $p = .003$ (see Figure 3.18). Linear mixed-effects analyses revealed a significant main effect of time, with both MBSR and PMR groups showing a decrease in daily average cortisol when analyzed using pre- to post-intervention and 8-week post-intervention data, $F(2, 40) = 4.24$, $p = .02$, and in analysis that also included 6-month post-intervention data, $F(3, 57) = 2.79$, $p = .05$.

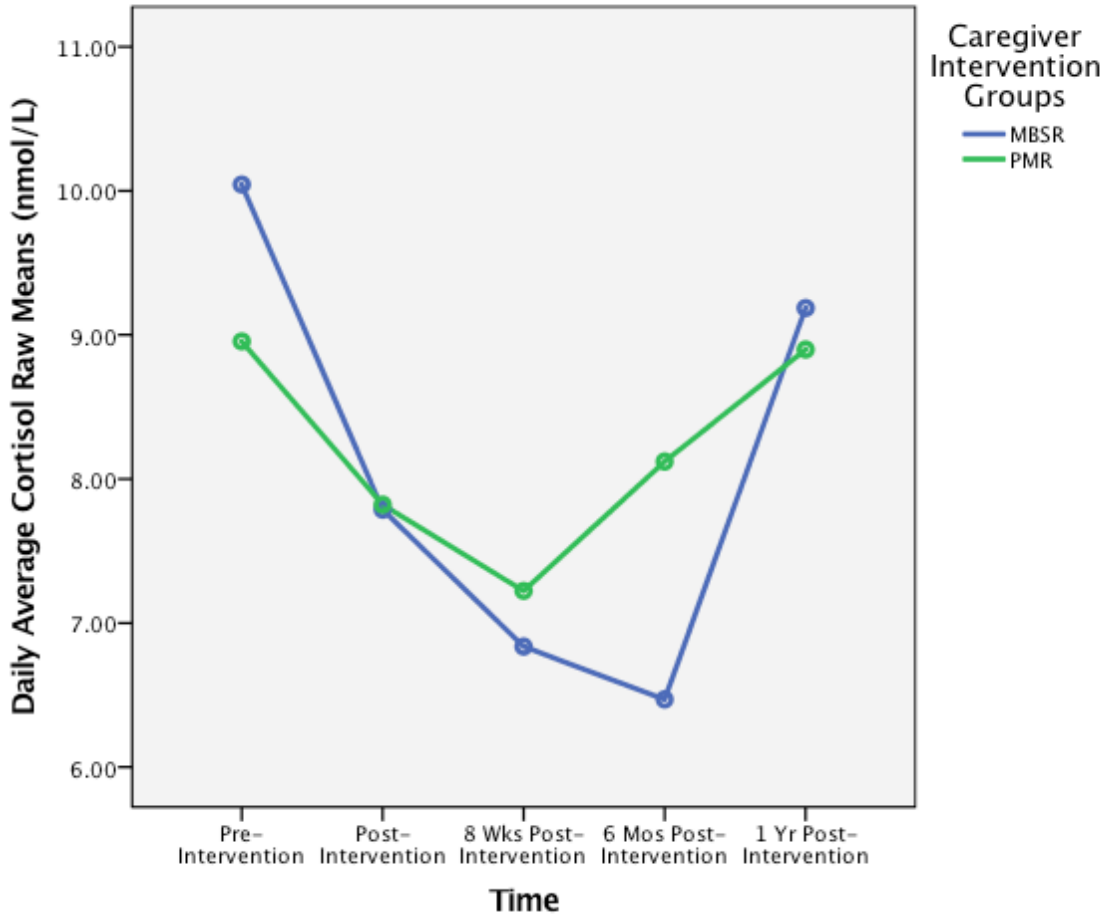


Figure 3.18 Daily Average Cortisol (DAC raw scores) over five assessments. Overall decreases in DAC levels are observed for both groups from pre-intervention to 8 weeks post-intervention, with an additional decrease observed at 6 months post-intervention for the MBSR group. At 1 year post-intervention, an increase in DAC levels is seen in both groups. Note that the apparent interactions at post-intervention and between 6 months post-intervention and 1 year post-intervention are not significant.

In addition to the home collection of salivary cortisol, three salivary cortisol samples were collected during a controlled laboratory experiment. During the laboratory assessment, three samples of saliva were collected: The first immediately after the end of the Mundane Events Recall task (MER), the second immediately after the end of the Caregiver-specific Mental Activation Task (CMAT—the emotional stress task), and the

third sample was collected 21 minutes after the initiation of the emotional stressor of the CMAT. The laboratory visits were scheduled two hours apart beginning at 8:00 a.m. and ending at 6:00 p.m. Across all 5 assessments, mean cortisol levels for the first sample ranged from 6.2–8.1 nmol/L (SD 3.4–5.2), for the second sample ranged from 6.1–8.0 nmol/L (SD 2.7–6.3), and for the third sample ranged from 5.2–7.6 nmol/L (SD 2.4–6.4). The cortisol levels of participants varied significantly from the first to the second sample and from the second to the third sample. Approximately half of the participants showed increases and half showed decreases in their cortisol levels from sample to sample. A general linear mixed-effects analysis of variance was used to analyze the lab cortisol data. Group and assessment (time) were modeled as fixed effects, while the first and second lab cortisol samples, named the stressor-specific cortisol response, and the second and third samples, termed the cortisol recovery, were nested within assessment and modeled as a random effect. Lab cortisol data were natural log–transformed to normalize distributions. An independent samples *t*-test showed no differences between the groups on the first lab cortisol sample, $t(22) = 1{,}57$, $p = .13$, *ns*. In linear mixed-effects analysis of the stressor-specific cortisol response (first and second cortisol samples) that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there were no significant main effects of time or group and no significant two-way or three-way interactions. Linear mixed-effects analyses revealed a significant time by group interaction when analyzed using pre- to post-intervention data, $F(1, 21) = 6.47$, $p = .02$. For the MBSR group only, pairwise comparisons were significant for stressor-specific cortisol response at pre-intervention ($p = .02$) and post-intervention ($p = .03$). Two-way and interactions were not significant in linear mixed-effects analyses

at any other time points. Main effects of time, group main effects or main effects of stressor-specific cortisol response were also not significant at any time point. In linear mixed-effects analysis of the cortisol recovery (second and third cortisol samples) that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there were no significant main effects of time or group and no significant three-way interactions. Linear mixed-effects analyses revealed a cortisol recovery by group interaction that approached significance, $F(1, 16) = 4.24$, $p = .056$. Results indicate that the MBSR group showed a greater reduction in cortisol recovery that approached significance when compared with the PMR group. For the MBSR group, the pairwise comparison for cortisol recovery approached significance at 8 weeks post-intervention ($p = .067$). For the PMR group, the pairwise comparison for cortisol recovery was significant at 8 weeks post-intervention ($p = .003$). There were no significant main effects of cortisol recovery, time or group. Two-way and three-way interactions of time by cortisol recovery by group were not significant in linear mixed-effects analyses at any other time points. However, linear mixed-effects analyses revealed a significant main effect of cortisol recovery when analyzed using pre- to post-intervention data, $F(1, 21) = 7.90$, $p = .01$, in analysis that included 8-week post-intervention data, $F(1, 19) = 13.62$, $p < .002$, and approached significance in analysis that also included 6-month post-intervention data, $F(1, 17) = 4.13$, $p = .058$, *ns*.

To examine whether differences in cortisol levels were related to patient problem behaviors, diurnal cortisol levels of Awakening, 4:00 p.m. and 9:00 p.m., used to calculate daily average cortisol, were compared to RMBPC Total Frequency of behavior problems which was median split into low and high behavior problem groups. General

linear mixed-effects analysis of variance was used to analyze the data. Group and RMBPC Frequency high vs. low were modeled as fixed effects, while the diurnal cortisol was modeled as a random effect. Linear mixed-effects analysis showed only a main effect of daily average cortisol at pre-intervention, $F(2, 40) = 82.10$, $p < .001$, post-intervention, $F(2, 42) = 86.74$, $p < .001$, 8 weeks post-intervention, $F(2, 36) = 59.01$, $p < .001$, 6 months post-intervention, $F(2, 38) = 78.40$, $p < .001$, and 1 year post-intervention, $F(2, 38) = 44.03$, $p < .001$. These non-significant results are consistent with that of de Vugt (2005) who also compared cortisol results with low and high behavioral and psychological symptoms of dementia.

To examine whether differences in cortisol levels were related to perceived stress, diurnal cortisol levels of Awakening, 4:00 p.m. and 9:00 p.m. were compared to PSS Total Score which was median split into low and high perceived stress groups. General linear mixed-effects analysis of variance was used to analyze the data. Group and PSS high vs. low were modeled as fixed effects, while the diurnal cortisol was modeled as a random effect. Similarly to the median split frequency of behavior problems, linear mixed-effects analysis showed only a main effect of daily average cortisol at each time point. The non-significant results are consistent with that of Pruessner, Hellhammer, and Kirschbaum (1999) who also compared morning cortisol with a median split PSS.

Task Appraisal Questions

During the laboratory visit, participants completed a task appraisal questionnaire after the Mundane Events Recall task (MER), and completed the same task appraisal questionnaire (with minor modifications to facilitate understanding) after the Caregiver-specific Mental Activation Task (CMAT). The items on the MER and CMAT

used a 7-point Likert scale with higher scores indicating higher levels of emotional difficulty and greater effort required to complete the task. A Task-related Emotional Difficulty mean score (TRED) was calculated for both the MER and CMAT appraisal questionnaires using four items: 1) "Overall, across all items, how upsetting did you find this task?" 2) "How much effort did you make to control your emotions during the task?" 3) "How emotionally difficult did you find it to think about this task?" and 4) "How much anxiety or bodily tension did you experience during this task?" The internal consistency for the MER TRED varied across assessments but was more consistent across assessments for the CMAT TRED (see Table 3.6 for results).

Table 3.6

Internal Consistency for the Task-Related Emotional Difficulty (TRED) Mean Score for the Mundane Events Recall (MER) and Caregiver-Specific Mental Activation Task (CMAT) Appraisal Questionnaires at Pre-Intervention, Post-Intervention, 8 Weeks Post-Intervention, 6 Months Post-Intervention, and 1 Year Post-Intervention

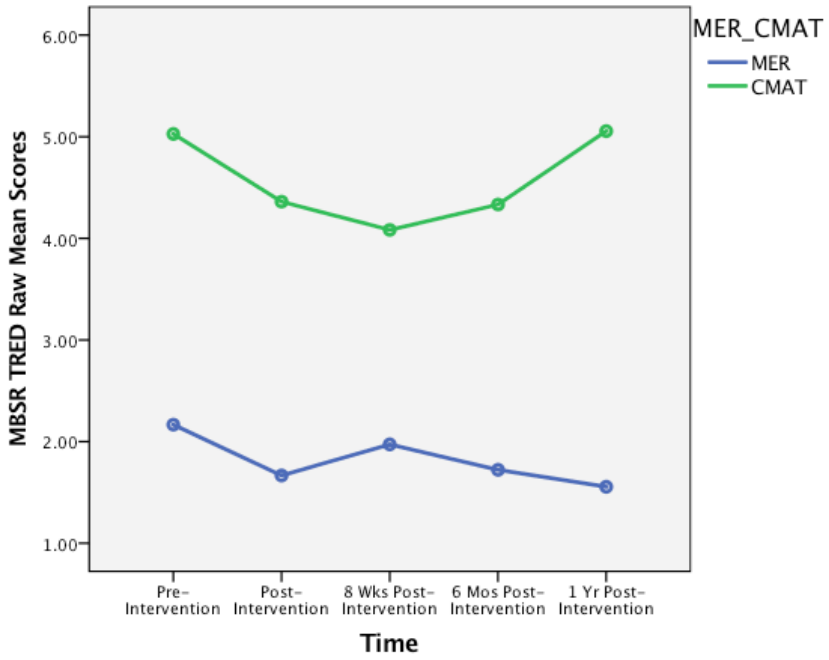
Both Groups	N	MER TRED Cronbach's Alpha	CMAT TRED Cronbach's Alpha
Pre-Intervention	25	$\alpha = 0.73$	$\alpha = 0.80$
Post-Intervention	24	$\alpha = 0.84$	$\alpha = 0.76$
8 Weeks Post	22	$\alpha = 0.75$	$\alpha = 0.80$
6 Months Post	19	$\alpha = 0.68$	$\alpha = 0.76$
1 Year Post	21	$\alpha = 0.33$	$\alpha = 0.87$

MER TRED and CMAT TRED data were natural log–transformed to normalize distributions. Paired samples *t*-tests of natural log–transformed data showed significant differences between the pre-stress test task appraisal scores completed after the MER

task, and post-stress test task appraisal scores completed after the CMAT, and verified that higher CMAT TRED scores occurred at each assessment, $t(24) = –9.10$, $p < .001$, at pre-intervention, $t(23) = –12.58$, $p < .001$, at post-intervention, $t(21) = –8.72$, $p < .001$, at 8 weeks post-intervention, $t(19) = –11.66$, $p < .001$, at 6 months post-intervention, and $t(20) = –12.44$, $p < .001$, at 1 year post-intervention. Significant differences between the MER TRED and CMAT TRED at pre-intervention, post-intervention, 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention confirmed the intended effect of the emotional stress test in eliciting a subjective emotional response that is consistent with the physiological SBP response.

An independent samples *t*-test showed no differences between the groups on MER TRED task appraisal scores, $t(23) = 1.47$, $p = .15$, *ns,* and CMAT TRED appraisal scores, $t(23) = 0.41$, $p = .69$, *ns* at pre-intervention. A general linear mixed-effects analysis of variance was used to analyze the MER TRED and CMAT TRED appraisal data. Group and assessment (time) were modeled as fixed effects, while pre- to post-stress appraisals (MER TRED to CMAT TRED) were nested within assessment and modeled as a random effect. In linear mixed-effects analysis of MER TRED to CMAT TRED that included pre- and post-intervention, 8-week, 6-month, and 1-year post-intervention data, there was a significant main effect of time $F(4, 64) = 2.61$, $p = .04$, and a significant main effect of MER TRED to CMAT TRED $F(1, 16) = 188.33$, $p < .001$, but no significant main effect of group. The two-way and three-way interactions were non-significant (see Figure 3.19).

MER TRED to CMAT TRED Scores for the MBSR Group



MER TRED to CMAT TRED Scores for the PMR Group

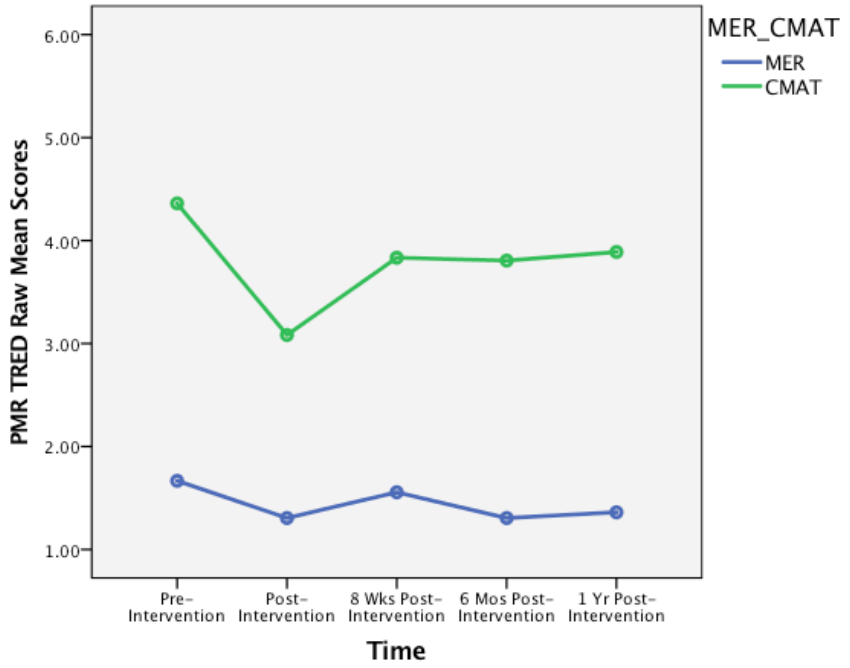


Figure 3.19 MER TRED to CMAT TRED scores over five assessments. These line graphs emphasize increases by group of task appraisal mean scores as a result of a controlled laboratory stress test. MER TRED scores remain mostly unchanged for both groups over five assessments. Decreases in CMAT TRED scores are observed for both groups from pre-intervention to post-intervention, with an additional decrease in CMAT TRED scores observed at 8 weeks post-intervention for the MBSR group. At 1 year post-intervention, CMAT TRED scores have returned to baseline for the MBSR group and remain below baseline for the PMR group.

The three-way interactions of time by MER TRED to CMAT TRED by group were not significant in linear mixed-effects analysis that included pre- to post-intervention data $F(1, 22) = 0.48$, $p = .50$, *ns*, in analyses that included 8-week post-intervention data $F(2, 40) = 0.44$, $p = .65$, *ns*, and in analyses that also included 6-month post-intervention data, $F(3, 51) = 0.49$, $p = .69$, *ns*. The two-way interactions were also non-significant at these time points.

Three additional task appraisal items were used to assess the degree to which participants reported their ability to 1) focus on the CMAT, 2) form a detailed mental image of the CMAT items, and 3) reflect on the CMAT items during the laboratory experiment as they normally do on a day-to-day basis. Participants, on average, reported a 6.17 of 7.00 (SD = 0.85) on the first question, "Overall, how much were you able to focus on the questions?" Participants, on average, reported a 6.02 of 7.00 (SD = 0.92) on the second question, "Overall, how detailed were your images of the events?" On a scale of 1 (very artificial. Never occurs like this) to 7 (Very similar to how I usually think about this event), on average, participants reported a 5.44 of 7.00 (SD = 1.43) on the question, "Compared to when you think about these events on your own (and not here in the laboratory), how similar was your experience today?" The scores on these items indicate that participants endorsed a high degree of involvement in the CMAT. In addition, participants reported that their thoughts and verbal responses to the CMAT items were fairly representative of their thoughts and descriptions of their caregiving experiences outside of the laboratory.

Correlations

For both groups combined, there were significant correlations among and between primary and secondary outcome measures. The GDS showed significant correlations with other primary outcome measures and also with secondary outcome measures. Self-reported levels of depression were significantly positively correlated with perceived levels of stress, caregiver burden, and loneliness at all assessments, indicating a robust association between symptoms of depression, perceived stress, perceived caregiver burden, and loneliness. The GDS also showed significant positive correlations with self-reported sleep quality at pre-intervention, post-intervention, 8 weeks post-intervention and 6 months post-intervention. In addition, the GDS showed a positive correlation with systolic blood pressure at 1 year post-intervention (see Table 3.7). Self-reported levels of depression were significantly negatively correlated with self-compassion at all assessments, as measured by the SCS, and also correlated significantly with the subscales of the SCS at each time point (see Table 3.8). Correlations between the GDS and dispositional mindfulness or behavioral problems were not significant. Similarly, correlations between self-reported symptoms of depression and salivary cortisol were not significant.

Table 3.7

Bivariate Correlations of Both MBSR and PMR Groups Combined Between the Geriatric Depression Scale (GDS) and the Perceived Stress Scale (PSS), the UCLA Loneliness Scale, the Zarit Burden Interview (ZBI), the Pittsburgh Sleep Quality Index (PSQI), Systolic Blood Pressure (SBP Mean 3), and the Self-Compassion Scale (SCS)

	GDS Pre-Intervention	*p*	GDS Post-Intervention	*p*	GDS 8 Wks Post-Intervention	*p*	GDS 6 Mos Post-Intervention	*p*	GDS 1 Year Post-Intervention	*p*
Perceived Stress	$r(25) = .69$	<.001	$r(25) = .73$	<.001	$r(23) = .71$	<.001	$r(23) = .55$	.006	$r(23) = .50$	.015
Loneliness	$r(25) = .48$	.016	$r(25) = .59$	.002	$r(23) = .68$	<.001	$r(23) = .63$	.001	$r(23) = .84$	<.001
Burden	$r(23) = .52$	.011	$r(23) = .46$	.026	$r(21) = .70$	<.001	$r(20) = .60$	.006	$r(19) = .66$	.002
Sleep Quality	$r(25) = .55$	.004	$r(25) = .59$	.002	$r(23) = .42$	.046	$r(20) = .60$	.006	$r(23) = .45$	.031
Pre-Stress SBP									$r(22) = .43$	.044
Post-Stress SBP									$r(21) = .49$	.024
Self-Compassion	$r(25) = -.69$	<.001	$r(25) = -.61$	.001	$r(23) = -.73$	<.001	$r(23) = -.54$	.008	$r(23) = -.64$	.001

Table 3.8

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 Pre-Intervention	*p*	GDS Post-Intervention	*p*	GDS 8 Wks Post-Intervention	*p*	GDS 6 Mos Post-Intervention	*p*	GDS 1 Year Post-Intervention	*p*
Self-Kindness	$r(25) = -.52$	.007	$r(25) = -.48$	.015	$r(23) = -.57$	.005			$r(23) = -.66$	.001
Common Humanity	$r(25) = -.45$	.025	$r(25) = -.48$	.016	$r(23) = -.63$	.001	$r(23) = -.52$	.011		
Mindfulness	$r(25) = -.64$	.001	$r(25) = -.40$	.047	$r(23) = -.79$	<.001	$r(23) = -.53$	.009	$r(23) = -.63$	.001
Self-Judgment	$r(25) = .52$	.008	$r(25) = .49$	.014	$r(23) = .55$	.007	$r(23) = .50$	. 016		
Isolation	$r(25) = .68$	<.001	$r(25) = .66$	<.001	$r(23) = .68$	<.001	$r(23) = .59$	.003	$r(23) = .67$	<.001
Over-Identified	$r(25) = .58$	.002	$r(25) = .53$	.007	$r(23) = .59$	.003	$r(23) = .51$	.014	$r(23) = .49$	.019

As reported in the GDS correlations results, for both groups combined, perceived levels of stress were significantly positively correlated with self-reported levels of depression. PSS also had significant positive correlations with loneliness, subjective burden and quality of sleep (see Table 3.9). Perceived stress was significantly negatively correlated with self-compassion as measured by the SCS and with the SCS subscales at pre-intervention, post-intervention, 8 weeks post-intervention and 6 months post-intervention (see Table 3.10). Correlations between perceived stress and mindfulness as measured by the MAAS were significant at 8 weeks post-intervention and 6 months post-intervention. Correlations between perceived stress and the frequency of patient problem behaviors were not significant, however, perceived stress was positively correlated with emotional reactivity to those behaviors at pre-intervention and 8 weeks post-intervention. In addition, perceived stress levels were positively correlated with pre-stress SBP at 1 year post-intervention, and with post-stress SBP at 8 weeks post-intervention. Correlations between PSS and salivary cortisol were not significant.

Table 3.9

Bivariate Correlations of Both MBSR and PMR Groups Combined Between the Perceived Stress Scale (PSS) and the Geriatric Depression Scale (GDS), the UCLA Loneliness Scale, the Zarit Burden Interview (ZBI), the Revised Memory and Behavior Problems Checklist Reaction (RMBPC Reaction), the Pittsburgh Sleep Quality Index (PSQI), Systolic Blood Pressure (SBP Mean 3), the Mindful Attention Awareness Scale (MAAS), and the Self-Compassion Scale (SCS)

	PSS Pre-Intervention	*p*	PSS Post-Intervention	*p*	PSS 8 Wks Post-Intervention	*p*	PSS 6 Mos Post-Intervention	*p*	PSS 1 Year Post-Intervention	*p*
Depressive Symptoms	$r(25) = .69$	<.001	$r(25) = .73$	<.001	$r(23) = .71$	<.001	$r(23) = .55$	.006	$r(23) = .50$	.015
Loneliness	$r(25) = .54$	.005	$r(25) = .59$	.002	$r(23) = .69$	<.001	$r(23) = .68$	<.001	$r(23) = .52$	.012
Burden	$r(23) = .72$	<.001	$r(23) = .69$	<.001	$r(21) = .71$	<.001	$r(20) = .66$	.002	$r(19) = .52$	.023
RMBPC Reaction	$r(23) = .55$	.006			$r(19) = .50$	.031				
Sleep Quality	$r(25) = .62$	.001	$r(25) = .56$	.004	$r(23) = .44$	.036				
Pre-Stress SBP									$r(22) = .43$	.043
Post-Stress SBP					$r(22) = .48$	.024				
MAAS					$r(23) = -.62$	.001	$r(23) = -.66$	.001		
Self-Compassion	$r(25) = -.65$	<.001	$r(25) = -.66$	<.001	$r(23) = -.78$	<.001	$r(23) = -.79$	<.001		

Table 3.10

Bivariate Correlations of Both MBSR and PMR Groups Combined Between the Perceived Stress Scale (PSS) and the Self-Compassion Scale (SCS) Subscales

SCS Subscales	PSS Pre-Intervention	*p*	PSS Post-Intervention	*p*	PSS 8 Wks Post-Intervention	*p*	PSS 6 Mos Post-Intervention	*p*	PSS 1 Year Post-Intervention	*p*
Self-Kindness			$r(25) = -.46$	.021	$r(23) = -.69$	<.001	$r(23) = -.70$	<.001		
Common Humanity			$r(25) = -.65$	<.001	$r(23) = -.61$	.002	$r(23) = -.66$	.001		
Mindfulness	$r(25) = -.64$	.001	$r(25) = -.56$	.003	$r(23) = -.66$	.001	$r(23) = -.78$	<.001		
Self-Judgment	$r(25) = .54$	.005	$r(25) = .43$	.033	$r(23) = .67$	<.001	$r(23) = .71$	<.001		
Isolation	$r(25) = .74$	<.001	$r(25) = .59$	.002	$r(23) = .70$	<.001	$r(23) = .73$	<.001		
Over-Identified	$r(25) = .61$	.001	$r(25) = .65$	<.001	$r(23) = .62$	.002	$r(23) = .69$	<.001		

As noted above, the Self-Compassion Scale (SCS) and its subscales were significantly correlated with both the GDS and PSS. In addition, the SCS was significantly positively correlated with MAAS at 8 weeks post-intervention, 6 months post-intervention, and 1 year post-intervention. Interestingly, among all cortisol measurements, the SCS was significantly *positively* correlated with 30 Minutes Post-Awakening cortisol at post-intervention, 6 months post-intervention, and 1 year post-intervention. Negative correlations with SCS were significant with loneliness at all assessments, and also with subjective burden at pre-intervention, 6 months post-intervention, and 1 year post-intervention (see Table 3.11). There was a significant negative correlation between SCS and emotional reactivity of the RMBPC at pre-intervention, $r(23) = -.58$, $p = .004$. There was a significant negative correlation between SCS and post-stress SBP at 8 weeks post-intervention, $r(22) = -.50$, $p = .017$. Correlations between the SCS and the frequency of patient problem behaviors and overall sleep quality were not significant.

Table 3.11

Bivariate Correlations of Both MBSR and PMR Groups Combined Between the Self-Compassion Scale (SCS) and the Mindful Attention Awareness Scale (MAAS), 30-Min Post-Awakening Cortisol, the Geriatric Depression Scale (GDS), the Perceived Stress Scale (PSS), the UCLA Loneliness Scale, and the Zarit Burden Interview (ZBI)

	SCS Pre-Intervention	*p*	SCS Post-Intervention	*p*	SCS 8 Wks Post-Intervention	*p*	SCS 6 Mos Post-Intervention	*p*	SCS 1 Year Post-Intervention	*p*
Mindfulness					$r(23) = .48$	.021	$r(23) = .53$	.010	$r(23) = .57$	.004
30 Min Cortisol	$r(25) = .39$	.057					$r(23) = .41$	.050	$r(23) = .43$	.039
Depressive Symptoms	$r(25) = -.69$	<.001	$r(25) = -.61$	.001	$r(23) = -.73$	<.001	$r(23) = -.54$	.008	$r(23) = -.64$	.001
Perceived Stress	$r(25) = -.65$	<.001	$r(25) = -.66$	<.001	$r(23) = -.78$	<.001	$r(23) = -.79$	<.001		
Loneliness	$r(25) = -.54$	.006	$r(25) = -.66$	<.001	$r(23) = -.74$	<.001	$r(23) = -.80$	<.001	$r(23) = -.73$	<.001
Burden	$r(23) = -.46$	.029			$r(21) = -.50$	.022	$r(20) = -.48$	.035		

Among the SCS subscales, the Common Humanity subscale was significantly negatively correlated with subjective burden as measured by the ZBI at pre-intervention, $r(23) = -.47$, $p = .023$, post-intervention, $r(23) = -.53$, $p = .009$, at 8 weeks post-intervention, $r(21) = -.56$, $p = .008$, and 6 months post-intervention, $r(20) = -.59$, $p = .006$. The SCS Mindfulness subscale was significantly negatively correlated with the ZBI at pre-intervention, $r(23) = -.55$, $p = .006$, at 8 weeks post-intervention, $r(21) = -.53$, $p = .014$, and at 6 months post-intervention, $r(20) = -.48$, $p = .032$. The SCS Mindfulness subscale was significantly positively correlated with the Mindful Attention Awareness Scale (MAAS) at 8 weeks post-intervention, $r(23) = .49$, $p = .017$, at 6 months post-intervention, $r(23) = .47$, $p = .023$, and at 1 year post-intervention, $r(23) = .55$, $p = .006$**.** The SCS Self-Kindness subscale was significantly positively correlated with MAAS at 6 months post-intervention, $r(23) = .51$, $p = .013$, and 1 year post-intervention, $r(23) = .49$, $p = .017$**.** The SCS Isolation subscale was significantly negatively correlated with MAAS at 8 weeks post-intervention, $r(23) = -.43$, $p = .038$, at 6 months post-intervention, $r(23) = -.41$, $p = .051$, and 1 year post-intervention, $r(23) = -.53$, $p = .009$**.** The SCS Over-Identified subscale was significantly negatively correlated with MAAS at 8 weeks post-intervention, $r(23) = -.49$, $p = .019$, and at 1 year post-intervention, $r(23) = -.52$, $p = .011$**.**

As noted above, the Mindful Attention Awareness Scale (MAAS), was significantly correlated with the SCS and several of the SCS subscales, and with the PSS. In addition, the MAAS was significantly negatively correlated with overall sleep quality as measured by the PSQI at post-intervention, 8 weeks post-intervention, and 1 year

post-intervention. MAAS was significantly negatively correlated with loneliness at 8 weeks post-intervention and 6 months post-intervention (see Table 3.12). Correlations between MAAS and symptoms of depression, subjective burden, frequency of patient problem behaviors, emotional reactivity to patient problem behaviors, systolic blood pressure and all cortisol measures were non-significant.

Among secondary dependent variables, the patient problem behaviors and emotional reactivity of patient problem behaviors as measured by the RMBPC had positive correlations to each other at pre-intervention, $r(23) = .56$, $p = .006$, at post-intervention, $r(23) = .59$, $p = .003$, and at 6 months post-intervention, $r(20) = .60$, $p = .005$. The patient problem behaviors and emotional reactivity of patient problem behaviors correlated with subjective burden. The RMBPC Frequency was positively correlated with ZBI at pre-intervention, $r(23) = .45$, $p = .030$, at post-intervention, $r(23) = .55$, $p = .006$, at 6 months post-intervention, $r(20) = .48$, $p = .031$, and at 1 year post-intervention, $r(19) = .63$, $p = .004$. The RMBPC Reaction was positively correlated with ZBI at post-intervention, $r(23) = .52$, $p = .012$, and at 8 weeks post-intervention, $r(19) = .50$, $p = .031$**.** The RMBPC Reaction was also positively correlated with post-stress test SBP at pre-intervention, $r(23) = .44$, $p = .035$, and at 8 weeks post-intervention, $r(18) = .58$, $p = .011$. As previously noted above, the RMBPC Reaction

Table 3.12

Bivariate Correlations of Both MBSR and PMR Groups Combined Between the Mindfulness Attention Awareness Scale (MAAS) and the Perceived Stress Scale (PSS), the UCLA Loneliness Scale, the Pittsburgh Sleep Quality Index (PSQI), the Self-Compassion Scale (SCS), and the Self-Compassion Scale (SCS) Subscales

	MAAS Pre-Intervention	*p*	MAAS Post-Intervention	*p*	MAAS 8 Wks Post-Intervention	*p*	MAAS 6 Mos Post-Intervention	*p*	MAAS 1 Year Post-Intervention	*p*
Perceived Stress					$r(23) = -.62$	.001	$r(23) = -.66$	.001		
Loneliness					$r(23) = -.45$	.031	$r(23) = -.56$	.006		
Sleep Quality			$r(25) = -.42$	.035	$r(23) = -.45$	.032			$r(23) = -.46$	.028
Self-Compassion					$r(23) = .48$	.021	$r(23) = .53$	.010	$r(23) = .57$	.004
Self-Kindness							$r(23) = .51$	.013	$r(23) = .49$	.017
Common Humanity							$r(23) = .45$	.031		
Mindfulness					$r(23) = .49$	.017	$r(23) = .47$	.023	$r(23) = .55$	.006
Self-Judgment							$r(23) = -.56$	.005		
Isolation					$r(23) = -.43$	.038	$r(23) = -.41$	.051	$r(23) = -.53$	.009
Over-Identified					$r(23) = -.49$	.019			$r(23) = -.52$	.011

had a positive correlation with perceived stress at pre-intervention and 8 weeks post-intervention. At pre-intervention only, RMBPC Reaction had a negative correlation with self-compassion, $r(23) = -.58$, $p = .004$, and negative correlations with Awakening cortisol, $r(22) = -.54$, $p = .009$, and daily average cortisol (DAC), $r(22) = -.56$, $p = .006$. Correlations between RMBPC and depression symptoms, dispositional mindfulness, loneliness, and overall sleep quality were not significant.

Correlations between subjective burden as measured by the ZBI and symptoms of depression, perceived stress, loneliness, patient problem behaviors, emotional reaction to patient problem behaviors, and self-compassion have been noted above (see Table 3.13). Correlations between the ZBI and dispositional mindfulness, overall sleep quality, systolic blood pressure and cortisol were non-significant.

Correlations between sleep quality as measured by the PSQI and symptoms of depression, perceived stress, and dispositional mindfulness have been noted above. Correlations between the PSQI and loneliness, subjective burden, patient problem behaviors, emotional reaction to patient problem behaviors, self-compassion, systolic blood pressure and cortisol were non-significant.

Table 3.13

Bivariate Correlations of Both MBSR and PMR Groups Combined Between the Zarit Burden Interview (ZBI) and the Geriatric Depression Scale (GDS), the Perceived Stress Scale (PSS), the UCLA Loneliness Scale, the Revised Memory and Behavior Problems Checklist Frequency (RMBPC Frequency), the Revised Memory and Behavior Problems Checklist Reaction (RMBPC Reaction), and the Self-Compassion Scale (SCS)

	ZBI Pre-Intervention	*p*	ZBI Post-Intervention	*p*	ZBI 8 Wks Post-Intervention	*p*	ZBI 6 Mos Post-Intervention	*p*	ZBI 1 Year Post-Intervention	*p*
Depressive Symptoms	$r(23) = .52$	.011	$r(23) = .46$	.026	$r(21) = .70$	<.001	$r(20) = .60$	.006	$r(19) = .66$	.002
Perceived Stress	$r(23) = .72$	< .001	$r(23) = .69$	<.001	$r(21) = .71$	<.001	$r(20) = .66$	.002	$r(19) = .52$	.023
Loneliness			$r(23) = .57$	.005	$r(21) = .51$	.019	$r(20) = .56$	.011	$r(19) = .53$	.019
RMBPC Frequency	$r(23) = .45$	.030	$r(23) = .55$	.006			$r(20) = .48$	.031	$r(19) = .63$	.004
RMBPC Reaction			$r(23) = .52$	.012	$r(19) = .50$	.031				
Self-Compassion	$r(23) = –.46$	.029			$r(21) = –.50$	.022	$r(20) = –.48$	.035		

Bivariate correlations were significant between SBP and several self-report dependent variables. For both groups combined at 1 year post-intervention, pre-stress test and post-stress test SBP was positively correlated with perceived symptoms of depression (GDS), $r(21) = .44$, $p = .05$ (pre-stress), and $r(20) = .50$, $p = .03$ (post-stress). Pre-stress test and post-stress test SBP at 1 year post-intervention was also positively correlated with GDS diagnosis, $r(21) = .47$, $p = .03$ (pre-stress), and $r(20) = .50$, $p = .03$ (post-stress), indicating a positive association between higher SBP among participants who met criteria for clinically significant symptoms of depression. In addition, at 1 year post-intervention, pre-stress SBP was positively correlated with perceived stress levels (PSS), $r(21) = .44$, $p = .05$. At 8 weeks post-intervention, post-stress test SBP was positively correlated with the RMBPC Reaction to problem behaviors, $r(17) = .52$, $p = .03$. In addition, at 8 weeks post-intervention, post-stress test SBP was positively correlated with the PSS perceived stress levels, $r(21) = .46$, $p = .04$, and with the self-judgment subscale of the Self-Compassion Scale (SCS), $r(21) = .47$, $p = .03$. There was a negative correlation between post-stress test SBP and self-compassion (SCS), $r(21) = –.45$, $p = .04$, 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.

Regarding the various cortisol measurements, Daily Average Cortisol (DAC), was correlated with neither Cortisol Awakening Response (CAR) nor with mean lab cortisol at pre-intervention or post-intervention. At 8 weeks post-intervention, DAC was positively correlated with mean lab cortisol, $r(22) = .53$, $p = .01$. At 6 months post-intervention, DAC was positively correlated with mean lab cortisol, $r(21) = .63$,

p = .002, but *negatively* correlated with CAR, $r(23) = -.56$, p = .005. At 1 year post-intervention, DAC was again negatively correlated with CAR, $r(23) = -.61$, p = .002.

DAC was negatively correlated with post-stress test SBP at pre-intervention, $r(24) = -.42$, p = .04, and mean lab cortisol was negatively correlated with pre-stress test SBP at post-intervention, $r(24) = -.46$, p = .02. As noted above, there was a negative correlation between DAC and RMBPC Reaction at pre-intervention, $r(22) = -.56$, p = .006. CAR was positively correlated with self-compassion at post-intervention, $r(25) = .43$, p = .03. DAC was negatively correlated with dispositional mindfulness at 8 weeks post-intervention, $r(23) = -.43$, p = .04. Correlations between salivary cortisol and symptoms of depression, perceived stress, sleep quality and subjective burden were non-significant.

Bivariate correlations were significant between TRED scores of the MER and CMAT and systolic blood pressure. For both groups combined at 1 year post-intervention, the MER TRED was positively correlated with both pre-stress test and post-stress test systolic blood pressure (SBP), $r(22) = .52$, p = .01 (pre-stress), and $r(21) = .47$, p = .03 (post-stress). In addition, for both groups combined at 1 year post-intervention, the CMAT TRED was positively correlated with both pre-stress test and post-stress test SBP, $r(21) = .58$, p = .005 (pre-stress), and $r(21) = .58$, p = .006 (post-stress). The MER TRED was also positively correlated with mean lab cortisol at pre-intervention, $r(24) = .47$, p = .02, and at 8 weeks post-intervention, $r(22) = .51$, p = .02.

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, $r(21) = .49$, $p = .03$. Correlations also showed that average home practice and changes in emotional reaction to patient problem behaviors, subjective burden and sleep quality were not related.

CHAPTER 4

DISCUSSION

Using a randomized controlled trial design, the present study compared Mindfulness-Based Stress Reduction and an active control condition based on progressive muscle relaxation and autogenic training, 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 dementia caregivers (Epstein-Lubow et al., 2011; Oken et al., 2010, Whitebird et al., 2012; Brown, Coogle, & Wegelin, 2016) 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.

Primary hypotheses predicted that from pre- to post-intervention for both groups, and to a greater extent for the MBSR group, that perceived levels of stress, loneliness and depressive symptoms would decrease, and that perceived levels of mindfulness and self-compassion would increase. Support for this hypothesis was found for symptoms of depression only. For symptoms of stress, both intervention groups showed similar reductions from pre- to post-intervention. For levels of perceived loneliness, there was no change for either group from pre- to post-intervention. Both the MBSR and PMR groups showed similar increases in perceived levels of dispositional mindfulness and self-compassion from pre- to post-intervention. In addition, for all five primary dependent variables, it was hypothesized that changes from pre- to post-intervention

would be sustained at 8 weeks, 6 months, and 1 year following the end of intervention training. This hypothesis was not supported for any of the primary dependent variables. At 8 weeks post-intervention, a reduction of the magnitude of pre- to post-intervention changes was observed in both groups for symptoms of depression (while remaining significant for the MBSR group) and for levels of dispositional mindfulness. Also, at 8 weeks post-intervention, the PMR group maintained its decrease in perceived levels of stress, while the MBSR group maintained its increase in perceived self-compassion. At 6 months and 1 year post-intervention, symptoms of depression remained below baseline readings for both groups and levels of dispositional mindfulness and perceived self-compassion remained above baseline readings for both groups. Levels of perceived stress had decreased significantly for the PMR group, and increased significantly for the MBSR group at 1 year post-intervention. Levels of perceived loneliness remained unchanged for both groups across all assessments.

In addition to the primary hypotheses investigating depression, perceived stress, perceived loneliness, perceived dispositional mindfulness, and perceived self-compassion, secondary hypotheses of this study predicted that for both groups, and to a greater extent for the MBSR group, from pre-intervention to 1 year post-intervention, perceived levels of caregiver burden, and caregiver emotional reactivity to care recipient problem behaviors would decrease, and that perceived levels of sleep quality would increase. Secondary hypotheses also involved predictions concerning biological measures thought related to stress: Systolic blood pressure and salivary cortisol. Among all the secondary hypotheses, support was not found. There was no significant change in subjective levels of caregiving burden for both groups from pre-intervention to 1 year

post-intervention. The frequency of care recipient behavior problems did not change across time, however, the PMR group showed a significantly greater reduction in the frequency of disruptive behaviors. Both groups reported decreases in emotional reactivity to problem behaviors over time, and, in addition, the reduction in emotional reactivity approached significance (p = .08) at 1 year post-intervention for the PMR group. Over the course of the study, both groups reported improvements in overall sleep quality. Significant reductions in diurnal 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, and 6 months post-intervention, while the PMR group maintained its post-intervention decrease at 8 weeks post-intervention. At 1 year post-intervention, a reduction of the magnitude of pre-intervention to 8-week and 6-month post-intervention changes was observed in both groups. This curvilinear pattern of change for both groups remained consistent with cortisol awakening response and daily average cortisol measurements. During the controlled caregiver-specific laboratory stress test, salivary cortisol failed to demonstrate a clear pattern of change from sample to sample or from assessment to assessment.

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, blunted awakening cortisol or cortisol awakening response is a better index of chronic stress among older caregivers. In the present study, it is important to note that salivary cortisol measurements varied significantly among participants, with some showing high awakening and high cortisol response values (a few apparently valid values were over three standard deviations from the mean), some showing blunted awakening or blunted cortisol response values, and a few showing the opposite of the expected cortisol peak at 30 Minutes Post-Awakening. While Awakening and 30 minutes Post-awakening cortisol levels were strongly associated with daily average cortisol levels, at some assessments the morning diurnal cortisol values showed either no association or a negative association with cortisol awakening response values. Therefore, the interpretation of diurnal cortisol results among dementia caregivers may be limited due to the variability of values that may reflect opposite but equally valid indices of chronic stress. In Chida and Steptoe's (2009) meta-analysis and review of 146 articles exploring the associations between cortisol awakening response and psychosocial factors, the increase of cortisol following awakening was positively associated with job stress and general life stress, and negatively associated with fatigue, exhaustion or "burnout." Whether these findings apply to elderly dementia caregivers is unknown, 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, cardiovascular disease and mortality.

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 and 6 months post-intervention. By 1 year post-intervention, a reduction of the magnitude of pre-intervention to 8-week and 6-month post-intervention changes was observed in both groups, with SBP values remaining below baseline values for both MBSR and PMR groups. Overall, SBP decreased over time, and the caregiver-specific emotional stress test resulted in increased post-stress 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 the possibility 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 SBP 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 from MBSR training among healthy community-dwelling adults when compared with a wait-list 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 after the caregiver-specific emotional stress test), decreased to the optimal range (< 120 mm Hg) by 8 weeks post-intervention (including after the caregiver-specific emotional stress test), and resting systolic blood pressure means remained at the optimal range by 1 year post-intervention (the caregiver-specific emotional stress post-test means were exactly 120 mm Hg). These resting SBP levels are similar to those found in a study of 66 elderly dementia caregivers (mean age = 71) by Chatillion et al. (2013) where the overall mean systolic blood pressure was 128 mm Hg (similar to the present study, dementia caregivers who reported severe hypertension or a history of uncontrolled hypertension were not eligible to participate). 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 percent increased risk of developing borderline hypertension over a 3-year period, when compared with non-caregivers. In a study of 650 baby boomer primary caregivers from the National Study of Caregiving (mean age = 57), Moon and Dilworth-Anderson (2015) found that high blood pressure was the most prevalent chronic disease among dementia caregivers and non-dementia caregivers. These finding suggest that older caregivers may be vulnerable to developing hypertension and illnesses related to elevated blood pressure. The observed reductions for both intervention groups 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 wait-list 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).

Since only one of the primary hypotheses was supported (i.e., that regarding depression symptoms, predicting a greater degree of symptom reduction with intervention for the MBSR, in comparison to the PMR group), it is unclear whether either intervention had a specific impact on symptoms of distress. Given the absence of a wait-list 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. 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 Scale 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 it 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 and secondary outcome measures across all assessments. Symptoms of depression had strong positive

correlations with levels of perceived stress, perceived loneliness, perceived subjective burden and overall quality of sleep, and all of those measures, excepting overall sleep quality, had strong negative correlations with levels of self-compassion. Subjective burden was also positively correlated with frequency of behavior problems and emotional reactivity to behavior problems. It is interesting to note that these measures of depression and distress are inversely related to self-compassion, contributing 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. By 1 year post-intervention, self-reported levels of isolation remained below baseline for both groups. 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 wait-list control group. In the present study, levels of isolation had strong positive correlations with symptoms of depression, loneliness 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, the 30 Minutes Post-Awakening cortisol, 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. Chida and Steptoe (2009) 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 8 weeks post-intervention for both groups, and further

reductions at 6 months post-intervention for the MBSR group 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 both MBSR and PMR interventions may be effective in reducing physiological indicators of stress among highly stressed populations. Again, further research employing a wait-list control group would be necessary to adequately test this.

As noted above, a limitation of the present study is the lack of a wait-list control group. Although other studies show significant improvements for MBSR groups when compared to wait-list control groups (e.g., Shapiro, Schwartz, & Bonner, 1998; Creswell et al., 2009, 2012), there are no MBSR versus wait-list control studies among older caregivers of persons with neurocognitive disorders. Therefore, we do not know how much change—or 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 non-caregivers, and despite improvements in symptoms of depression and medical symptoms after placement of their care recipient to skilled nursing care or after the death of the care recipient, 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 possible 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 or social support programs (MacCoon et al., 2011; Brown, Coogle, & Wegelin, 2016). This raises an interesting question about how relaxation and meditation techniques differ in terms of potentially 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, could also have been achieved as a consequence of the focusing upon the tension and releasing tension sequence of the muscle groups in 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. These observations are supported by an increase in dispositional mindfulness as measured by the MAAS shown by both groups from pre- to post-intervention, with gains sustained at 1 year post-intervention. For both groups combined, there were positive correlations between MAAS and self-compassion, the SCS subscales of self-kindness and mindfulness, and negative correlations between MAAS and overall sleep quality, perceived stress, loneliness, and the SCS subscales of isolation and over-identification of negative thoughts and emotions. 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 asked to focus on their mental processes or overall 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, perceived stress, 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 wait-list 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 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. Given that the median length of caregiving in the present study was 4 to 8 years, it is feasible that progressively reduced social engagement and constant caregiving could lead to an entrenched sense of loneliness and burden, which remained unchanged throughout the study for both groups. Although speculative, it is possible that early participation by caregivers in group-based interventions could strengthen and bolster a much-needed sense of self-efficacy and support, which could in turn delay onset of or perhaps prevent feelings of loneliness or subjective burden. 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. A "Health Plan Outreach", described as targeted communications to physicians, medical clinic staff, and health plan members, was the most successful strategy used to generate initial interest and contact in the

Whitebird et al. (2012) MBSR caregiver study. According to Whitebird et al. (2011), the Health Plan Outreach recruitment strategy was also one of the best sources of recruitment for the study. In addition, a preliminary study of mindfulness training for both caregivers with their care recipients was encouraging, suggesting the possibility that both could benefit simultaneously from early participation in group-based interventions (Paller et al., 2015). However, 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 social 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 (as recommended by Dickerson & Kemeny, 2004), although weekend days may not be significantly different than week days 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 wait-list 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, for example, 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. Much could be gleaned towards modifying or designing additional components to MBSR from mindfulness instructors who are experienced in working with older adults in general and with older dementia caregivers in particular, as well as from dementia caregiver elders who have first-person experience of the challenges faced, for example, McBee (2003) and Hoblitzelle (2008).

In summary, this study provides a promising initial suggestion that MBSR and relaxation-based interventions may potentially 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, 6 months and 1 year following the end of intervention training. PMR reduced perceived stress to a significantly greater degree than was observed for MBSR at 1 year post-intervention. Whether this greater benefit of MBSR regarding symptoms of depression and similar significant benefit in perceived stress of PMR are chance differences, given the number of dependent variable comparisons in the present study, is unknown. Despite a general curvilinear pattern of changes observed, with improvements seen from pre-intervention to post-intervention, and further improvements seen at 8 weeks post-intervention, followed by a reduction in magnitude of changes, by 1 year post-intervention, both MBSR and PMR groups showed decreases in systolic blood pressure, levels of diurnal cortisol, emotional reactivity to patient problem behaviors, self-judgment, and over-identification with negative thoughts and emotions. Additionally, by 1 year post-intervention, both groups showed increases in dispositional mindfulness, self-compassion, self-kindness, and overall sleep quality. It will be important to replicate and extend the present initial findings in larger samples that include both wait-list and active control groups.

APPENDIX A
PHONE SCREEN INSTRUMENTS

Phone Screening Script for Intervention Study
This script will be used for returning phone calls from interested participants.

If a person does not reply, leave the following message on an answering machine:

"Hello, my name is _____. I am a research assistant calling from the Neuropsychology, Emotion and Memory Laboratory at the University of Arizona. I am returning your call about the research study on stress reduction. This study will evaluate two, 8-week training programs for their effectiveness in reducing symptoms of stress for adults aged 55 and over. Please call back and let me know when you will be available to talk by phone about this study. Thank you for your interest, we really appreciate it. I look forward to talking with you soon."

If a person responds, please read the following:

"Hello, my name is _____. Can I speak to _____? Hello _____. I am a research assistant calling from the Neuropsychology, Emotion and Memory Laboratory at the University of Arizona. I am returning your call about the research study on stress reduction. Are you still interested in learning more about the study?"

If the person is no longer interested, read the following:

"Well, thanks so much anyway for calling in about it. I hope you have a good day. Bye, bye."

If the person is interested in learning more about the study, ask if this is a good time to talk. If not, make an appointment to talk at a more convenient time. If this is a good time for the person, read the following:

"That's great. We are recruiting men and women of all racial and ethnic backgrounds, who are 55 years of age and older. This study will evaluate two, 8-week training programs for their effectiveness in reducing symptoms of stress. The study will last about 2 years and will involve attending classes for 8 weeks to learn stress-reduction techniques, practicing these techniques regularly, and coming to the university on 5 occasions to complete simple, behavioral tests.

Does this sound like something you would be interested in participating in?"

If the person is no longer interested, read the following:

"Well, thanks so much anyway for calling in about it. I hope you have a good day. Bye, bye."

If the person continues to express interest in the study, read the following:

"Participating in the study may provide some benefits to you and, in addition, you will contribute greatly in helping researchers learn if these stress-reduction interventions are helpful with people as they age.

I would like to ask you some questions, to ensure that you are eligible to participate. This will take about 15 minutes. Afterwards, if you are still interested in participating in the study, I will answer all your questions and tell you the next steps in the project. First, I need to read the following statement to you that protects your rights before answering questions about yourself."

Proceed to the **Pre-Screen Disclosure Statement** and read it in its entirety, then read the following:

"Do you have any questions?"

Answer questions unless they are covered in the following questionnaire, then proceed to the **General Health and Demographics Screen** asking all of the questions and recording all the answers by hand, taking any additional notes if necessary. If the person is <u>not</u> eligible, read the following:

"Thank you for answering the questions. Unfortunately, because of some of your answers, you are not eligible to participate in the study. However, as I read to you, all of the information you shared with me to this point will be destroyed. Do you have any other questions? Thank you so much for your time today. Goodbye."

If eligibility cannot be definitely determined during the interview, read the following:

"Thank you for answering the questions. We will review your answers and call you back to tell you if you are eligible to participate in the study. When is a good time to call you? Thanks again. Bye, bye."

If the person is eligible to participate in the study, read the following:

"Thank you for answering the questions. Based on your answers, you are eligible to participate in the study and we would like to invite you to the next stage of the study. Even though you are eligible, all the information you shared with me to this point will be destroyed. There is a lot of information we need to give you about the study and we expect that you and other eligible people will have many questions. The easiest way to convey all the information required and answer all of the questions that may arise about the study, is to invite you to a group orientation. At this orientation, you will learn about the two training programs that will be taught, you will also learn about what you will do during the assessment visits. You will have an opportunity to ask questions and hear the answers to other people's questions. Only after all of your questions have been answered

and you've had some time to think about the study, will you be asked to sign a consent form in order to participate. It is important for you to know that you can withdraw from the study at any time, and, if after learning all the information about the study, you decide not to participate any further, then you will not have to sign the consent form. Do you have any questions about the next stage of the study? The Laboratory will call and inform you of the date and time of the group orientation and provide you with directions to the location. The group orientation will last about an hour, depending on how many attend and the number of questions. Thanks again for your time today. We look forward to seeing you at the orientation. Bye, bye."

Pre-Screen Disclosure Statement

Title of Project: The Effectiveness of two stress reduction interventions among middle-aged and older adults.

You are being invited to voluntarily participate in a research study the purpose of which is to evaluate two, 8-week training programs for their effectiveness in reducing symptoms of stress and burden among middle-aged and older adults. This prescreening process will determine if you are eligible to participate in the study.

If you agree to participate, your participation will involve one interview about your health history and demographic information. The interview will take place over the phone in a location convenient for you and will last approximately 15 to 20 minutes. You may choose not to answer some or all of the questions. During the interview, written notes will be made in order to help the investigator review what is said. Your name will be kept separate from these notes.

Any questions you have will be answered and you may withdraw from the study at any time. There are no known risks from your participation in this interview and no direct benefit from your participation is expected. There is no cost to you except for your time and you will not be compensated for your participation in the prescreening interview.

Only the principal investigator and research team members will have access to your name and the information that you provide. In order to maintain your confidentiality, your name will not be revealed in any reports that result from this project. Interview information will be locked in a cabinet in a secure place. The answers you give during the prescreening will be confidential and only used to determine whether you are eligible to participate in the study. If you do not qualify, all personal information will be destroyed. If you are eligible to participate in the study, all personal information will also be destroyed. You may decide not to begin or to stop the interview at any time. Your refusing to participate or your decision to discontinue your participation will have no adverse effect. Also, any new information discovered about the research will be provided to you. This information could affect your willingness to continue your participation.

You may be removed from the study by the investigator for these reasons:
You are not 55 years of age or older; you are not able to speak and understand English well enough to understand the verbal material presented during the study; you have a prior history of cardiovascular disease, uncontrolled hypertension, serious medical illness that could prevent you from attending classes, or a history of drug or alcohol abuse.

You can call the Principal Investigator to tell her about a concern or complaint about this research study. The Principal Investigator, Rose Marie O'Donnell, can be called at (520) 621-9255. If you have questions about your rights as a research subject, you may call the University of Arizona Human Subjects Protection Program office at (520) 626-6721. If you have questions, complaints, or concerns about the research and cannot reach the Principal Investigator, or want to talk to someone other than the Investigator, you may

call The University of Arizona Human Subjects Protection Program office. (If out of state use the toll-free number 1-866-278-1455.) If you would like to contact the Human Subjects Protection Program via the Web (this can be anonymous), please visit http://www.irb.arizona.edu/contact/.

By participating in the interview, you are giving permission for the investigator to use your information for research purposes.

Thank you.

General Health and Demographics Screen

S#_____

1. Your Gender: ☐ Male ☐ Female

2. Your Age: _____

3. Are you a caregiver? ☐ Yes ☐ No

4. If you are a caregiver, what is your relationship to the care recipient?
   ☐ Spouse/Partner ☐ Son
   ☐ Sibling ☐ Daughter
   ☐ Friend
   ☐ Other Please specify: _____

5. Physician diagnosis of care recipient: _____

6. Do you have any difficulty understanding English? ☐ Yes ☐ No
   If yes, please explain_____
_____
_____
_____
_____
_____

7. Do you have any difficulty reading? ☐ Yes ☐ No
   If yes, please explain_____
_____
_____
_____
_____
_____

8. Do you have any assistance with your own daily needs? ☐ Yes ☐ No

9. Do you drive? ☐ Yes ☐ No
   If no, how do you travel, shop, and get around?_____
_____
_____
_____

10. Have you ever been formally diagnosed by your primary care physician, a psychiatrist or psychologist with the following psychiatric disorders?

Depression	☐ Yes	☐ No
Panic Disorder	☐ Yes	☐ No
Psychotic Disorder	☐ Yes	☐ No
Eating Disorder	☐ Yes	☐ No
Post Traumatic Stress Disorder	☐ Yes	☐ No

If you answered "Yes" to any of the above, please record approximate months/years that you received the diagnosis and its duration here:

_____
_____
_____
_____

11. Have you ever thought about ending your life? ☐ Yes ☐ No
If yes, please explain_____

_____
_____
_____
_____
_____
_____

12. In the past year, have you had:

Recurring severe headaches	☐ Yes	☐ No
Troublesome double vision	☐ Yes	☐ No
Troublesome dizzy spells	☐ Yes	☐ No
Lost ability to speak for a few minutes	☐ Yes	☐ No
Blackout spells	☐ Yes	☐ No
Serious trouble with memory or concentration	☐ Yes	☐ No

If you answered "Yes" to any of the above, please record approximate time and duration of symptoms here:

_____
_____
_____

13. Have you had a stroke or heart attack in the last 6 months? ☐ Yes ☐ No

14. Have you EVER had:

A stroke	☐ Yes	☐ No
A heart attack	☐ Yes	☐ No
Paralysis	☐ Yes	☐ No
Multiple Sclerosis	☐ Yes	☐ No
Seizures in the past 5 years	☐ Yes	☐ No
Chronic pain	☐ Yes	☐ No

(if so, location- _____)

If you answered "Yes" to any of the above, please record approximate Months/Years here:

_____
_____
_____
_____

15. How often do you drink alcohol (beer, wine, or hard liquor?)

a. Never
b. Less than once a month
c. Approximately once a week
d. A few times a week
e. Almost daily

16. When you drink alcohol, how much do you drink?

a. More than two drinks
b. Two drinks
c. One drink
d. I never drink

17. Do you currently smoke? ☐ Yes ☐ No

If "Yes", how many cigarettes per day? _____

18. Do you have a medical condition that would prevent you from attending weekly classes?

☐ Yes ☐ No

If you answered "Yes", please explain:

_____
_____
_____
_____

19. Typically, how much of the following caffeinated beverages do you drink PER DAY?

TEA	Coffee	COLA
____None	____None	____None
____0–2 cups	____0–2 cups	____0–2 cups
____3–6 cups	____3–6 cups	____3–6 cups
____More than 6	____More than 6	____More than 6

20. Do you take any kinds of illicit drugs (by smoking, sniffing, pills or injections)?

a. Never
b. Very rarely
c. Rarely
d. Occasionally
e. often

21. Are you in treatment or recovery from alcohol or substance abuse?

☐ Yes ☐ No

If you answered "Yes", please provide details of length of abuse/dependence and length of recovery:_____
_____
_____
_____

APPENDIX B
ORIENTATION QUESTIONNAIRE PACKET

COVER SHEET

Subject # ____ ____ ____ ____ ____

Name _____ _____
(First name) (Last name)

Phone Number: (___ ___ ___) ___ ___ ___-___ ___ ___ ___ (home)
(___ ___ ___) ___ ___ ___-___ ___ ___ ___ (work) EXT: _____
(___ ___ ___) ___ ___ ___-___ ___ ___ ___ (Mobile/Others: _____)

E-mail address: _____

How did you hear about the study? _____

Do not write below this line

Approved for Participation? ☐ Yes ☐ No

Notes: _____

Initials:_____ Date: __ __ / __ __ / __ __ __ __ (MM/DD/YYYY)

Notes: _____
_____
_____
_____
_____

S#_____

Please answer all questions below. Please do not include your name or any identifying information on the following pages. Thank you.

1. Your Gender: ☐ Male ☐ Female

2. Your Age: _____

3. Are you a caregiver? ☐ Yes ☐ No

4. If you are a caregiver, what is your relationship to the care recipient?
   ☐ Spouse/Partner ☐ Son
   ☐ Sibling ☐ Daughter
   ☐ Friend
   ☐ Other Please specify: _____

5. Physician diagnosis of care recipient: _____

6. Do you have any difficulty understanding English? ☐ Yes ☐ No
   If yes, please explain_____
_____
_____
_____
_____
_____

7. Do you have any difficulty reading? ☐ Yes ☐ No
   If yes, please explain_____
_____
_____
_____
_____
_____

8. Do you have any assistance with your own daily needs? ☐ Yes ☐ No

9. Do you drive? ☐ Yes ☐ No
   If no, how do you travel, shop, and get around?_____
_____
_____
_____

10. Have you ever been formally diagnosed by your primary care physician, a psychiatrist or psychologist with the following psychiatric disorders?

Depression	☐ Yes	☐ No
Panic Disorder	☐ Yes	☐ No
Psychotic Disorder	☐ Yes	☐ No
Eating Disorder	☐ Yes	☐ No
Post Traumatic Stress Disorder	☐ Yes	☐ No

If you answered "Yes" to any of the above, please record approximate months/years that you received the diagnosis and its duration here:

_____
_____
_____
_____

11. Have you ever thought about ending your life? ☐ Yes ☐ No
If yes, please explain_____

_____
_____
_____
_____
_____
_____

12. In the past year, have you had:

Recurring severe headaches	☐ Yes	☐ No
Troublesome double vision	☐ Yes	☐ No
Troublesome dizzy spells	☐ Yes	☐ No
Lost ability to speak for a few minutes	☐ Yes	☐ No
Blackout spells	☐ Yes	☐ No
Serious trouble with memory or concentration	☐ Yes	☐ No

If you answered "Yes" to any of the above, please record approximate time and duration of symptoms here:

_____
_____
_____

13. Have you had a stroke or heart attack in the last 6 months? ☐ Yes ☐ No

14. Have you EVER had:

A stroke	☐ Yes	☐ No
A heart attack	☐ Yes	☐ No
Paralysis	☐ Yes	☐ No
Multiple Sclerosis	☐ Yes	☐ No
Seizures in the past 5 years	☐ Yes	☐ No
Chronic pain	☐ Yes	☐ No

(if so, location- _____)

If you answered "Yes" to any of the above, please record approximate Months/Years here:

_____
_____
_____
_____

15. How often do you drink alcohol (beer, wine, or hard liquor?)

a. Never
b. Less than once a month
c. Approximately once a week
d. A few times a week
e. Almost daily

16. When you drink alcohol, how much do you drink?

a. More than two drinks
b. Two drinks
c. One drink
d. I never drink

17. Do you currently smoke? ☐ Yes ☐ No

If "Yes", how many cigarettes per day? _____

18. Do you have a medical condition that would prevent you from attending weekly classes?

☐ Yes ☐ No

If you answered "Yes", please explain:

_____
_____
_____
_____

19. Typically, how much of the following caffeinated beverages do you drink PER DAY?

TEA	Coffee	COLA
____None	____None	____None
____0–2 cups	____0–2 cups	____0–2 cups
____3–6 cups	____3–6 cups	____3–6 cups
____More than 6	____More than 6	____More than 6

20. Do you take any kinds of illicit drugs (by smoking, sniffing, pills or injections)?

a. Never
b. Very rarely
c. Rarely
d. Occasionally
e. often

21. Are you in treatment or recovery from alcohol or substance abuse?

☐ Yes ☐ No

If you answered "Yes", please provide details of length of abuse/dependence and length of recovery:_____
_____
_____
_____

22. Have you ever been exposed to any emotional or physical abuse?

☐ Yes ☐ No

If you answered "Yes", please state whether abuse was emotional, physical or both, length of abuse and when it occurred (no other details are necessary):

_____
_____
_____

23. Do you take any **vitamins, supplements, natural remedies or tonics?** For example: Laxatives, diet pills, vitamins, antacids, or cold remedies?
If yes, list the names, dosages and how often you take them.

_____
_____
_____
_____

24. Have you EVER had any of the following?

Allergies	☐ Yes	☐ No
Asthma	☐ Yes	☐ No
Anemia	☐ Yes	☐ No
Diabetes	☐ Yes	☐ No
Alcoholism	☐ Yes	☐ No
Psychiatric Illness	☐ Yes	☐ No
Glaucoma	☐ Yes	☐ No
Heart Disease	☐ Yes	☐ No
Hypertension	☐ Yes	☐ No
Chronic Bronchitis	☐ Yes	☐ No
Emphysema	☐ Yes	☐ No
Tuberculosis	☐ Yes	☐ No
Kidney Disease	☐ Yes	☐ No
Stomach/Ulcer	☐ Yes	☐ No
Hepatitis	☐ Yes	☐ No
Arthritis	☐ Yes	☐ No
High cholesterol	☐ Yes	☐ No
Colon polyps	☐ Yes	☐ No
Thyroid disease	☐ Yes	☐ No
Fibroids	☐ Yes	☐ No
Any type of cancer	☐ Yes	☐ No

If you answered "Yes" to cancer, please specify:

_____
_____
_____
_____
_____
_____
_____

1. Do you, or did you recently (in the last two months) experience any of the following:
[Please list them to me in the order you experienced them (place a number on the corresponding line starting with "1" for the first symptom experienced).]

❒ ____Fever
❒ ____Nausea
❒ ____Vomiting
❒ ____Headache
❒ ____Joint pain
❒ ____Blurred Vision
❒ ____Stiff Neck
❒ ____Other _____
❒ ____Other _____
❒ ____Other _____
❒ ____Other _____

❒ ____ Rash
❒ ____ Diarrhea
❒ ____ Abdominal pain
❒ ____ Neck/Back pain
❒ ____ Muscle pain
❒ ____ Fatigue
❒ ____ Weakness
❒ ____ Paralysis
❒ ____ Confusion
❒ ____ Seizures
❒ ____ Tremors

2. Were you ever vaccinated for:
Influenza (Flu) ❒ Yes. Date of last vaccine: _____ ❒ No
❒ Don't remember

3. Do you or did you ever have any of the following immunosuppressive conditions or treatment?
Cancer: ❒ Yes ❒ No ❒ Don't Know

If yes, did you undergo chemotherapy or radiation treatment? ❒ Yes ❒ No
Type of cancer: _____ Year diagnosed: _____

HIV: ❒ Yes ❒ No ❒ Don't Know

If yes, are you taking any antiretroviral therapy? ❒ Yes ❒ No
If yes, list medications: (1) _____
(2) _____
(3) _____
(4) _____

Diabetes mellitus: ❒ Yes ❒ No ❒ Don't Know

Steroid therapy: ❒ Yes (duration:_____) ❒ No ❒ Don't Know

Transplant recipient: ❒ Yes ❒ No ❒ Don't Know

If yes, were you taking antirejection medications? ❒ Yes ❒ No
If yes, list medications: (1) _____
(2) _____
(3) _____
(4) _____

Other immunosuppressing conditions: _____

4. Have you ever been told by a doctor that you had any of the following conditions? (DK= don't know)

High blood pressure? ❒ Yes ❒ No ❒ Don't Know
Epilepsy or seizure? ❒ Yes ❒ No ❒ Don't Know
Stroke? ❒ Yes (year:_____) ❒ No ❒ Don't Know
Heart attack? ❒ Yes (year:_____) ❒ No ❒ Don't Know
Lung disease? ❒ Yes (type:_____) ❒ No ❒ Don't Know
Kidney disease? ❒ Yes (type:_____) ❒ No ❒ Don't Know
Liver disease? ❒ Yes (type:_____) ❒ No ❒ Don't Know
Other neurologic disease? ❒ Yes (list:_____) ❒ No ❒ Don't Know
Meningitis/encephalitis? ❒ Yes (year:_____) ❒ No ❒ Don't Know
Head injury with loss of consciousness? ❒ Yes (year:____) ❒ No ❒ Don't Know

Arthritis/chronic joint pain? ❒ Yes (which joint(s):_____)
❒ No ❒ Don't Know

Hepatitis? ❒ Yes (type: ❒ A ❒ B ❒ C ❒ E ❒ other:_____)
❒ No ❒ Don't Know

5. Are you taking any medication for any of the above conditions?

_____
_____
_____
_____
_____
_____

6. In addition to the above, please tell me what prescription medications/drugs are you taking at the present:

❒ Drug name _____ ❒ Drug name _____
❒ Drug name _____ ❒ Drug name _____
❒ Drug name _____ ❒ Drug name _____
❒ Drug name _____ ❒ Drug name _____
❒ Drug name _____ ❒ Drug name _____
❒ Drug name _____ ❒ Drug name _____

7. In addition to the above, please tell me what over-the-counter medications/drugs are you taking at the present:

❒ Aspirin (dose/day_____) ❒ Motrin/Advil/Ibuprofen (dose/day___)
❒ Tylenol (dose/day_____) ❒ Other _____
❒ Other _____ ❒ Other _____
❒ Other _____ ❒ Other _____

8. Do you want to share any other details on your health and/or fitness?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

S#_____

We would like you to indicate below how much you believe, *right now*, that the intervention you are receiving will help to reduce your levels of stress. Belief usually has two aspects to it: (1) what one *thinks* will happen and (2) what one *feels* will happen. Sometimes these are similar; sometimes they are different. Please answer the questions below. In the first set, answer in terms of what you *think*. In the second set answer in terms of what you really and truly *feel*. Your instructor will not see these ratings until after the intervention has ended.

Set I

1. At this point, how logical does the intervention offered to you seem?

1 2 3 4 5 6 7 8 9
not at all logical somewhat logical very logical

2. At this point, how successfully do you think this intervention will be in reducing your symptoms of stress?

1 2 3 4 5 6 7 8 9
not at all useful somewhat useful very useful

3. How confident would you be in recommending this intervention to a friend who experiences similar problems?

1 2 3 4 5 6 7 8 9
not at all confident somewhat confident very confident

4. By the end of the intervention training, how much improvement in your stress symptoms do you think will occur?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Set II

For this set, close your eyes for a few moments, and try to identify what you really *feel* about the intervention and its likely success. Then answer the following questions.

1. At this point, how much do you really *feel* that the intervention will help you to reduce your symptoms of stress?

1 2 3 4 5 6 7 8 9
not at all somewhat Very much

2. By the end of the intervention period, how much improvement in your stress symptoms do you really *feel* will occur?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

S#: _____

Please answer all questions below. Please do not include your name or any identifying information on the following pages. Thank you.

1. Gender: ☐ Male ☐ Female

2. Age: _____

3. Race/Ethnicity:
   ☐ White/Anglo
   ☐ Black/African American
   ☐ American Indian/Alaskan Native
   ☐ Native Hawaiian/Pacific Islander
   ☐ Asian
   ☐ Hispanic or Latino

4. Education achieved:
   ☐ Some high school
   ☐ Graduated from high school/GED
   ☐ Some Trade/Vocational school
   ☐ Graduated from Trade/Vocational school
   ☐ Some college
   ☐ Graduated from college
   ☐ Masters or equivalent
   ☐ Doctorate or equivalent

5. Current Occupation:
   ☐ Full-time paid employment
   ☐ Part-time paid employment
   ☐ Full-time self-employment
   ☐ Part-time self-employment
   ☐ Retired

6. Present or pre-retirement occupation: _____

7. Do you have a regular practice of meditation or relaxation exercises?

   ☐ Yes ☐ No

   If yes, describe the practice: _____

   How often do you practice?_____

S#: _____

Please answer all questions below. Please do not include your name or any identifying information on the following pages. Thank you.

8. Are you a caregiver? ☐ Yes ☐ No

9. What is your relationship to the care recipient?
☐ Spouse/Partner ☐ Son
☐ Sibling ☐ Daughter
☐ Friend
☐ Other Please specify: _____

10. Physician diagnosis of care recipient: _____

11. Where does the care recipient reside? (Check all that apply)
☐ At my home or apartment
☐ At their own home or apartment
☐ Assisted living environment
☐ Nursing home
☐ Other Please specify: _____

12. Length of care recipient illness:
☐ Six months or less ☐ 6–12 months
☐ 13–18 months ☐ 19–24 months
☐ 25–30 months ☐ 31–36 months
☐ 37–42 months ☐ 43–48 months
☐ 4–8 years ☐ 9–12 years
☐ 13–15 years ☐ 16–20 years
☐ Over 20 years

13. How often do you interact with your care recipient?

Once every	☐ Day	☐ Week	☐ 2 weeks	☐ Month
Several times per	☐ Day	☐ Week	☐ 2 weeks	☐ Month

14. Age of care recipient: _____

15. Gender of care recipient: ☐ Male ☐ Female

APPENDIX C
ASSESSMENT QUESTIONNAIRE PACKET

COVER SHEET

Subject # ____ ____ ____ ____ ____

Name (print) _____ _____
(First name) (Last name)

Today's Date _____

Thank you in advance for completing this questionnaire packet. There are 13 pages in total in this packet. Please take your time while answering these questions.

Please take a short break during this time if you want to.
Please answer all questions. Your answers are very important to us.

S#_____

Instructions: Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be.

1	2	3	4	5	6
Almost Always	Very frequently	Somewhat Frequently	Somewhat Infrequently	Very Infrequently	Almost Never

I could be experiencing some emotion and not be conscious of it until some time later.	1 2 3 4 5 6
I break or spill things because of carelessness, not paying attention, or thinking of something else.	1 2 3 4 5 6
I find it difficult to stay focused on what's happening in the present.	1 2 3 4 5 6
I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.	1 2 3 4 5 6
I tend not to notice feelings of physical tension or discomfort until they really grab my attention.	1 2 3 4 5 6
I forget a person's name almost as soon as I've been told it for the first time.	1 2 3 4 5 6
It seems I am "running on automatic," without much awareness of what I'm doing.	1 2 3 4 5 6
I rush through activities without being really attentive to them.	1 2 3 4 5 6
I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.	1 2 3 4 5 6
I do jobs or tasks automatically, without being aware of what I'm doing.	1 2 3 4 5 6
I find myself listening to someone with one ear, doing something else at the same time.	1 2 3 4 5 6
I drive places on "automatic pilot" and then wonder why I went there.	1 2 3 4 5 6
I find myself preoccupied with the future or the past.	1 2 3 4 5 6
I find myself doing things without paying attention.	1 2 3 4 5 6
I snack without being aware that I'm eating.	1 2 3 4 5 6

S#_____

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

1	2	3	4	5
Almost Never				**Almost Always**

_____ 1. I'm disapproving and judgmental about my own flaws and inadequacies.

_____ 2. When I'm feeling down I tend to obsess and fixate on everything that's wrong.

_____ 3. When things are going badly for me, I see the difficulties as part of life that everyone goes through.

_____ 4. When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world.

_____ 5. I try to be loving towards myself when I'm feeling emotional pain.

_____ 6. When I fail at something important to me I become consumed by feelings of inadequacy.

_____ 7. When I'm down and out, I remind myself that there are lots of other people in the world feeling like I am.

_____ 8. When times are really difficult, I tend to be tough on myself.

_____ 9. When something upsets me I try to keep my emotions in balance.

_____ 10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.

_____ 11. I'm intolerant and impatient towards those aspects of my personality I don't like.

_____ 12. When I'm going through a very hard time, I give myself the caring and tenderness I need.

_____ 13. When I'm feeling down, I tend to feel like most other people are probably happier than I am.

S#_____

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

1	2	3	4	5
Almost Never				**Almost Always**

_____ 14. When something painful happens I try to take a balanced view of the situation.

_____ 15. I try to see my failings as part of the human condition.

_____ 16. When I see aspects of myself that I don't like, I get down on myself.

_____ 17. When I fail at something important to me I try to keep things in perspective.

_____ 18. When I'm really struggling, I tend to feel like other people must be having an easier time of it.

_____ 19. I'm kind to myself when I'm experiencing suffering.

_____ 20. When something upsets me I get carried away with my feelings.

_____ 21. I can be a bit cold-hearted towards myself when I'm experiencing suffering.

_____ 22. When I'm feeling down I try to approach my feelings with curiosity and openness.

_____ 23. I'm tolerant of my own flaws and inadequacies.

_____ 24. When something painful happens I tend to blow the incident out of proportion.

_____ 25. When I fail at something that's important to me, I tend to feel alone in my failure.

_____ 26. I try to be understanding and patient towards those aspects of my personality I don't like.

S#_____

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

---

0 = Never
1 = Almost Never
2 = Sometimes
3 = Fairly Often
4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly? **0 1 2 3 4**

2. In the last month, how often have you felt that you were unable to control the important things in your life?..... **0 1 2 3 4**

3. In the last month, how often have you felt nervous and "stressed"? **0 1 2 3 4**

4. In the last month, how often have you felt confident about your ability to handle your personal problems? **0 1 2 3 4**

5. In the last month, how often have you felt that things were going your way?..... **0 1 2 3 4**

6. In the last month, how often have you found that you could not cope with all the things that you had to do? **0 1 2 3 4**

7. In the last month, how often have you been able to control irritations in your life? **0 1 2 3 4**

8. In the last month, how often have you felt that you were on top of things? ……**0 1 2 3 4**

9. In the last month, how often have you been angered because of things that were outside of your control? **0 1 2 3 4**

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? **0 1 2 3 4**

S#: _____

Choose the best answer for **how you have felt over the past week:**

1.	Are you basically satisfied with your life?	☐ Yes ☐ No
2.	Have you dropped many of your activities and interests?	☐ Yes ☐ No
3.	Do you feel that your life is empty?	☐ Yes ☐ No
4.	Do you often get bored?	☐ Yes ☐ No
5.	Are you in good spirits most of the time?	☐ Yes ☐ No
6.	Are you afraid that something bad is going to happen to you?	☐ Yes ☐ No
7.	Do you feel happy most of the time?	☐ Yes ☐ No
8.	Do you often feel helpless?	☐ Yes ☐ No
9.	Do you prefer to stay at home, rather than going out and doing new things?	☐ Yes ☐ No
10.	Do you feel you have more problems with memory than most?	☐ Yes ☐ No
11.	Do you think it is wonderful to be alive now?	☐ Yes ☐ No
12.	Do you feel pretty worthless the way you are now?	☐ Yes ☐ No
13.	Do you feel full of energy?	☐ Yes ☐ No
14.	Do you feel that your situation is hopeless?	☐ Yes ☐ No
15.	Do you think that most people are better off than you are?	☐ Yes ☐ No

S#: _____

Indicate how often you experience the feelings listed by circling the number in the box that best corresponds to the frequency of these feelings.

	Never	**Rarely**	**Sometimes**	**Quite Frequently**	**Nearly Always**
1. Do you feel that because of the time you spend with your relative that you don't have enough time for yourself?	0	1	2	3	4
2. Do you feel stressed between caring for your relative and trying to meet other responsibilities (work/family)?	0	1	2	3	4
3. Do you feel angry when you are around your relative?	0	1	2	3	4
4. Do you feel that your relative currently affects your relationship with family members or friends in a negative way?	0	1	2	3	4
5. Do you feel strained when you are around your relative?	0	1	2	3	4
6. Do you feel that your health has suffered because of your involvement with your relative?	0	1	2	3	4
7. Do you feel that you don't have as much privacy as you would like because of your relative?	0	1	2	3	4

	Never	Rarely	Sometimes	Quite Frequently	Nearly Always
8. Do you feel that your social life has suffered because you are caring for your relative?	0	1	2	3	4
9. Do you feel that you have lost control of your life since your relative's illness?	0	1	2	3	4
10. Do you feel uncertain about what to do about your relative?	0	1	2	3	4
11. Do you feel you should be doing more for your relative?	0	1	2	3	4
12. Do you feel you could do a better job in caring for your relative?	0	1	2	3	4

S#: _____

The following is a list of problems patients sometimes have. Please indicate if any of these problems have occurred during the past week. If so, how much has this bothered or upset you when it happened? Use the following scales for the frequency of the problem and your reactions to it. Please read the description of the ratings carefully.

FREQUENCY RATINGS:
0 = never occurred
1 = not in the past week
2 = 1 to 2 times in the past week
3 = 3 to 6 times in the past week
4 = daily or more often
9 = don't know/not applicable

REACTION RATINGS;
0 = not at all
1 = a little
2 = moderately
3 = very much
4 = extremely
9 = don't know/not applicable

Please answer all the questions below. Please circle a number from 0–9 for both *frequency* and *reaction*.

	FREQUENCY							REACTION					
1. Asking the same question over and over	0	1	2	3	4	9		0	1	2	3	4	9
2. Trouble remembering recent events (e.g., items in the newspaper or on TV)	0	1	2	3	4	9		0	1	2	3	4	9
3. Trouble remembering significant past events	0	1	2	3	4	9		0	1	2	3	4	9
4. Losing or misplacing things	0	1	2	3	4	9		0	1	2	3	4	9
5. Forgetting what day it is	0	1	2	3	4	9		0	1	2	3	4	9
6. Starting, but not finishing, things	0	1	2	3	4	9		0	1	2	3	4	9
7. Difficulty concentrating on a task	0	1	2	3	4	9		0	1	2	3	4	9
8. Destroying property	0	1	2	3	4	9		0	1	2	3	4	9
9. Doing things that embarrass you	0	1	2	3	4	9		0	1	2	3	4	9
10. Waking you or other family members up at night	0	1	2	3	4	9		0	1	2	3	4	9

	FREQUENCY							REACTION					
11. Talking loudly and rapidly	0	1	2	3	4	9		0	1	2	3	4	9
12. Appears anxious or worried	0	1	2	3	4	9		0	1	2	3	4	9
13. Engaging in behavior that is potentially dangerous to self or others	0	1	2	3	4	9		0	1	2	3	4	9
14. Threats to hurt oneself	0	1	2	3	4	9		0	1	2	3	4	9
15. Threats to hurt others	0	1	2	3	4	9		0	1	2	3	4	9
16. Aggressive to others verbally	0	1	2	3	4	9		0	1	2	3	4	9
17. Appears sad or depressed	0	1	2	3	4	9		0	1	2	3	4	9
18. Expressing feelings of hopelessness or sadness about the future (e.g., "Nothing worthwhile ever happens," "I never do anything right")	0	1	2	3	4	9		0	1	2	3	4	9
19. Crying and tearfulness	0	1	2	3	4	9		0	1	2	3	4	9
20. Commenting about death of self or others (e.g., "Life isn't worth living," "I'd be better off dead")	0	1	2	3	4	9		0	1	2	3	4	9
21. Talking about feeling lonely	0	1	2	3	4	9		0	1	2	3	4	9
22. Comments about feeling worthless or being a burden to others	0	1	2	3	4	9		0	1	2	3	4	9
23. Comments about feeling like a failure or about not having any worthwhile accomplishment in life	0	1	2	3	4	9		0	1	2	3	4	9
24. Arguing, irritability, and/or complaining	0	1	2	3	4	9		0	1	2	3	4	9

S#_____

Directions: Indicate how often you feel the way described in each of the following statements. Circle one number for each.

Statement	Never	Rarely	Sometimes	Often
1. I feel in tune with the people around me	1	2	3	4
2. I lack companionship	1	2	3	4
3. There is no one I can turn to	1	2	3	4
4. I do not feel alone	1	2	3	4
5. I feel part of a group of friends	1	2	3	4
6. I have a lot in common with the people around me	1	2	3	4
	1	2	3	4
7. I am no longer close to anyone	1	2	3	4
8. My interests and ideas are not shared by those around me	1	2	3	4
	1	2	3	4
9. I am an outgoing person	1	2	3	4
10. There are people I feel close to	1	2	3	4
11. I feel left out	1	2	3	4
12. My social relationships are superficial	1	2	3	4
13. No one really knows me well	1	2	3	4
14. I feel isolated from others	1	2	3	4
15. I can find companionship when I want it	1	2	3	4
16. There are people who really understand me	1	2	3	4
	1	2	3	4
17. I am unhappy being so withdrawn	1	2	3	4
18. People are around me but not with me	1	2	3	4
19. There are people I can talk to	1	2	3	4
20. There are people I can turn to	1	2	3	4

ID#_____

Instructions:
The following questions relate to your usual sleep habits during the past month *only*. Your answers should indicate the most accurate reply for the *majority* of days and nights in the past month.
Please answer all questions.

1. During the past month, when have you usually gone to bed at night?
   USUAL BED TIME_____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?
   NUMBER OF MINUTES_____

3. During the past month, when have you usually gotten up in the morning?
   USUAL GETTING UP TIME_____

4. During the past month, how many hours of *actual sleep* did you get at night? (This may be different than the number of hours you spend in bed.)
   HOURS OF SLEEP PER NIGHT_____

For each of the remaining questions, check the one best response. Please answer *all* questions.

5. During the past month, how often have you had trouble sleeping because you . . .
   (a) Cannot get to sleep within 30 minutes

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

   (b) Wake up in the middle of the night or early morning

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

   (c) Have to get up to use the bathroom

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

   (d) Cannot breathe comfortably

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

   (e) Cough or snore loudly

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

   (f) Feel too cold

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

(g) Feel too hot

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

(h) Had bad dreams

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

(i) Have pain

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

(j) Other reason(s), please describe_____

_____

How often during the past month have you had trouble sleeping because of this?

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

6. During the past month, how would you rate your sleep quality overall?

Very good _____
Fairly good _____
Fairly bad _____
Very bad _____

7. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month___	Less than once a week___	Once or twice a week___	Three or more times a week___

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all _____
Only a very slight problem _____
Somewhat of a problem _____
A very big problem _____

10. Do you have a bed partner or roommate?

No bed partner or roommate _____
Partner/roommate in other room _____
Partner in same room, but not same bed _____
Partner in same bed _____

APPENDIX D
TESTING ROOM INSTRUMENTS

Testing Room Form

Date_____ Participant Number_____

RAs_____ and _____

Readings	BP1	BP2	BP3	BP4	BP5
BP-A					
BP-B					
BP-C					
BP-D					
AVG BP					

Height	
Weight	
BMI	

AVG BP Assessment	

Notes:_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

BP-A reading is discarded. The avg BP reading is calculated from BP-B, BP-C, and BP-D.

Avg BP Assessment is the average of BP1 through BP5.

MER Questions (Circle the Best Choice) **ID:**

1. Overall, how much were you able to focus on the questions?

1	2	3	4	5	6	7
Not able to focus at all						Excellent focus Thought about question the entire time

2. Overall, how detailed were your images of the events?

1	2	3	4	5	6	7
Very hazy Difficult to recall						Very detailed Extremely easy to recall

3. Overall, across all items, how happy did these questions make you?

1	2	3	4	5	6	7
Not happy at all						Very, very happy

4. Overall, across all items, how upsetting did you find this task?

1	2	3	4	5	6	7
Not upsetting at all						Terribly upsetting

5. Compared to when you think about these events on your own (not in the lab), how similar was your experience today?

1	2	3	4	5	6	7
Very artificial. Never occurs like this.						Very similar to how I usually think about this event

6. How much effort did you make to control your emotions during the task?

1	2	3	4	5	6	7
None at all						A great deal of effort

7. How much did you allow yourself to freely experience your emotions during the task?

1	2	3	4	5	6	7
Not at all I detached myself from the feelings						Very much I allowed many strong emotions

8. How emotionally difficult did you find it to think about this task?

1	2	3	4	5	6	7
Not difficult at all						Very difficult

9. How much anxiety or bodily tension did you experience during this task?

1	2	3	4	5	6	7
None at all						A great deal of tension

10. How much sadness did you experience during this task?

1	2	3	4	5	6	7
None at all						A great deal of sadness

11. During the task, I actively tried to feel/experience less negative emotion.

1	2	3	4	5	6	7
Not at all						Very much the case

12. During the task, I tried to look on the "bright side" of the experience.

1	2	3	4	5	6	7
Not at all						Very much the case

CMAT Questions (Circle the Best Choice) **ID:**

1. Overall, how much were you able to focus on the questions?

1	2	3	4	5	6	7
Not able to focus at all					Excellent focus Thought about question the entire time	

2. Overall, how detailed were your images of the events?

1	2	3	4	5	6	7
Very hazy Difficult to recall						Very detailed Extremely easy to recall

3. Overall, across all items, how happy did these questions make you?

1	2	3	4	5	6	7
Not happy at all						Very, very happy

4. Overall, across all items, how upsetting did you find this task?

1	2	3	4	5	6	7
Not upsetting at all						Terribly upsetting

5. Compared to when you think about these events on your own (and not here in the laboratory), how similar was your experience today?

1	2	3	4	5	6	7
Very artificial. Never occurs like this.						Very similar to how I usually think about this event

6. How much effort did you make to control your emotions during the task (in order to *not* become upset or overwhelmed)?

1	2	3	4	5	6	7
None at all						A great deal of effort

7. How much did you allow yourself to freely experience your emotions during the task?

1	2	3	4	5	6	7
Not at all I detached myself from the feelings						Very much I allowed many strong emotions

8. How emotionally difficult did you find it to think about your loved one and your relationship history with him/her?

1	2	3	4	5	6	7
Not difficult at all						Very difficult

9. How much anxiety or bodily tension did you experience during this task?

1	2	3	4	5	6	7
None at all						A great deal of tension

10. How much sadness did you experience during this task?

1	2	3	4	5	6	7
None at all						A great deal of sadness

11. During the task, I actively tried to feel/experience less negative emotion.

1	2	3	4	5	6	7
Not at all						Very much the case

12. During the task, I tried to look on the "bright side" of the experience.

1	2	3	4	5	6	7
Not at all						Very much the case

REFERENCES

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.

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.

Atienza, A. A., Henderson, P. C., Wilcox, S., & King, A. C. (2001). Gender differences in cardiovascular response to dementia caregiving. *The Gerontologist, 41,* 490–498.

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

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory II.* San Antonio, Texas: The Psychological Corporation.

Bédard, M., Molloy, D. W., Squire, L., Dubois, S., Lever, J. A., & O'Donnell, M. (2001). The Zarit Burden Interview: A New Short Version and Screening Version. *The Gerontologist, 41,* 652–657.

Bédard, M., Pedlar, D., Martin, N. J., Malott, O., & Stones, M. J. (2000). Burden in caregivers of cognitively impaired older adults living in the community: Methodological issues and determinants. *International Psychogeriatrics, 12,* 307–332.

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., Coogle, C. L., & Wegelin, J. (2016). A pilot randomized controlled trial of mindfulness-based stress reduction for caregivers of family members with dementia. *Aging & Mental Health, 20,* 1157–1166.

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.

Buysse, D.J., Reynolds, C.F., Monk, T.H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28,* 193–213.

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.

Carmody, J. F., Crawford, S., & Churchill, L. (2006). A pilot study of Mindfulness-based Stress Reduction for hot flashes. *Menopause, 13,* 760–769.

Carpenter, J.S., Andrykowski, M.A. (1998). Psychometric evaluation of the Pittsburgh Sleep Quality Index. *Journal of Psychosomatic Research, 45,* 5–13.

Carroll, D., Smith, G. D., Shipley, M. J., Steptoe, A., Brunner, E. J., & Marmot, M.G. (2001). Blood pressure reactions to acute psychological stress and future blood pressure status: A 10-year follow-up of men in the Whitehall II Study. *Psychosomatic Medicine, 63,* 737–743.

Center for Mindfulness in Medicine, Health Care and Society. (n.d.). *Major research findings.* Retrieved 6/18/09 from http://www.umassmed.edu/Content.aspx?id=42426.

Chattillion, E. A., Ceglowski, J., Roepke, S. K., von Känel, R., Losada, A., Mills, P. J., . . . Mausbach, B. T. (2013). Pleasant events, activity restriction, and blood pressure in dementia caregivers. *Health Psychology, 32,* 793–801.

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

Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo, J. L., . . . Roccella, E. J. (2003). Seventh report of the Joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Hypertension, 42*, 1206–1252.

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. (2009). Mindfulness meditation training effects of 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., et al. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine, 65,* 564–570.

Davidson, R. J., & Kaszniak, A. W. (2015). Conceptual and methodological issues in research on mindfulness and meditation. *American Psychologist, 70,* 581–592.

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.

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin, 130,* 355–391.

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.

Gallegos, A. M., Hoerger, M., Talbot, N. L., Krasner, M. S., Knight, J. M., Moynihan, J. A., & Duberstein, P. R. (2013). Toward identifying the effects of specific components of mindfulness-based stress reduction on biologic and emotional outcomes among older adults. *The Journal of Alternative and Complementary Medicine, 19,* 787–792.

Gallegos, A. M., Hoerger, M., Talbot, N. L., Moynihan, J. A., & Duberstein, P. R. (2013). Emotional benefits of mindfulness-based stress reduction in older adults:

The moderating roles of age and depressive symptom severity. *Aging & Mental Health, 17,* 823–829.

Gitlin, L. N., Belle, S. H., Burgio, L. D., Czaja, S. J., Mahoney, D., Gallagher-Thompson, D., . . . Ory, M. G. (2003). Effect of multicomponent interventions on caregiver burden and depression: The REACH multisite initiative at 6-month follow-up. *Psychology and Aging, 18,* 361–374.

Goyal, M., Singh, S., Sibinga, E. M. S., Gould, N. F., Rowland-Seymour, A., Sharma, R., . . . Haythornthwaite, J. A. (2014). Meditation programs for psychological stress and well-being: A systematic review and meta-analysis. *Journal of the American Medical Association Internal Medicine, 174,* 357–368.

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.

Helvaci, M. R. & Seyhanli, M. (2006). What a High Prevalence of White Coat Hypertension in Society! *Internal Medicine, 45,* 671–674.

Ho, L., Bloom, P. A., Vega, J. G., Yemul, S., Zhao, W., Ward, L., . . . Pasinetti, G. M. (2016). Biomarkers of resilience in stress reduction for caregivers of Alzheimer's patients. *NeuroMolecular Medicine, 18,* 177–189.

Hoblitzelle, O. A. (2008). *The majesty of your loving: A couple's journey through Alzheimer's.* Cambridge, MA: Green Mountain Books.

Jaffray, L., Bridgman, H., Stephens, M., & Skinner, T. (2016). Evaluating the effects of mindfulness-based interventions for informal palliative caregivers: A systematic literature review. *Palliative Medicine, 30,* 117–131.

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.

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. *Clinical Journal of Pain, 2,* 159–173.

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

Kabat-Zinn, J., Relman, A., Riley, D., Hosmer, D., & Dossey, L. (2001). Parsing the data: An examination of a study on meditation and the treatment of psoriasis: A critical exchange. *Advances in Mind-body Medicine, 17,* 66–77.

King, A. C., Oka, R. K., & Young, D. R. (1994). Ambulatory blood pressure and heart rate responses to the stress of work and caregiving in older women. *Journal of Gerontology, 49,* M239–M245.

Koh, D. S., & Koh, G. C. (2007). The use of salivary biomarkers in occupational and environmental medicine. *Occupational and Environmental Medicine, 64,* 202–210.

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.

Lundberg, U. (2004). Stress hormones in health and illness: The roles of work and gender. *Psychoneuroendocrinology, 30,* 1017–1021.

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.

McEwen, B. S. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine, 338,* 171–179.

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.

Moon, H., & Dilworth-Anderson, P. (2015). Baby boomer caregiver and dementia caregiving: Findings from the National Study of Caregiving. *Age and Ageing, 44,* 300–306.

Morone, N. E., Greco, C. M., Moore, C. G., Rollman, B. L., Lane, B., Morrow, L. A., . . . Weiner, D. K. (2016). A mind-body program for older adults with chronic low back pain. *JAMA Internal Medicine, 176,* 329–337.

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.

Moynihan, J. A., Chapman, B. P., Klorman, R., Krasner, M. S., Duberstein, P. R., Brown, K. W., & Talbot, N. L. (2013). Mindfulness-based stress reduction for older adults: Effects on executive function, frontal alpha asymmetry and immune function. *Neuropsychobiology, 68,* 34–43.

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

Nielsen, L., & Kaszniak, A. W. (2006). Awareness of subtle emotional feelings: A comparison of long-term meditators and non-meditators. *Emotion, 6,* 392–405.

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*, *32,* 1110–1113.

O'Connor, M.-F., Allen, J. J. B., & Kaszniak, A. W. (2002). Autonomic and emotion regulation in bereavement and depression. *Journal of Psychosomatic Research, 52,* 183–185.

O'Connor, M.-F., Allen, J. J. B., & Kaszniak, A. W. (2005). Emotional disclosure for whom? A study of vagal tone in bereavement. *Biological Psychology, 68,* 135–146.

O'Donnell, R. M. (2013). Mindfulness-based stress reduction as an intervention among family caregivers of persons with neurocognitive disorders (unpublished master's thesis). University of Arizona, Tucson, Arizona.

O'Donnell, R. M., Kaszniak, A. W., Ziebell, S. E., & Menchola, M. (2011). *Mindfulness-Based Stress Reduction among middle-aged and older family caregivers of persons with neurocognitive disorders: Results at 8 weeks post-intervention.* Poster session presented at the Mind and Life Summer Research Institute, Garrison, NY.

O'Donnell, R. M., Kaszniak, A. W., & Menchola, M. (2008). *Self-reported emotion regulation strategy, perceived health and burden among caregivers of persons with dementia.* Poster session presented at the annual meeting of the Arizona Alzheimer's Consortium, Phoenix, AZ.

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.

Paller, K. A., Creery, J. D., Florczak, S. M., Weintraub, S., Mesulam, M.-M., Reber, P.J., . . . Maslar, M. (2015). Benefits of mindfulness training for patients with progressive cognitive decline and their caregivers. *American Journal of Alzheimer's Disease & Other Dementias, 30,* 257–267.

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.

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

Roth, D. L., Burgio, L. D., Gitlin, L. N., Gallagher-Thompson, D., Coon, D. W., Belle, S. H., . . . Burns, R. (2003). Psychometric analysis of the revised memory and behavior problems checklist: Factor structure of occurrence and reaction ratings. *Psychology and Aging, 18,* 906–915.

Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology, 39*, 472–480.

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.

Saxe, G., Hebert, J., Carmody, J., Kabat-Zinn, J., Rosenzweig, P., Jarzobski, D., . . . Blute, R. D. (2001). Can diet, in conjunction with stress reduction, affect the rate of increase in prostate-specific antigen after biochemical recurrence of prostate cancer? *Journal of Urology, 166,* 2202–2207.

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., 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 evidence and development of a shorter version. In T. L. Brink (Ed.), *Clinical Gerontology: A Guide to Assessment and Intervention* (pp. 165–173). NY: The Haworth Press, Inc.

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.

Stress Reduction Clinic (2009). *Mindfulness-based stress reduction (MBSR) curriculum guide.* Center for Mindfulness in Medicine, Health Care, and Society. Copy in possession of author.

Teri, L., Truax, P., Logsdon, R., G., Uomoto, J., Zarit, S., & Vitaliano, P. P. (1992). Assessment of behavioral problems in dementia: The Revised Memory and Behavior Problems Checklist. *Psychology and Aging,* 7, 622–631.

Varadhan, R., Walston, J., Cappola, A. R., Carlson, M. C., Wand, G. S., & Fried, L. P. (2008). Higher levels and blunted diurnal variation of cortisol in frail older women. *Journal of Gerontology, 63A,* 190–195.

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., Adler, K. A., Patterson, T. L., Mills, P. J., & Grant, I. (2005). Exaggerated plasma fibrin formation (D-dimer) in elderly Alzheimer caregivers as compared to noncaregiving controls. *Gerontology, 51,* 7–13.

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. *Psychosomatic Medicine, 65,* 145–150.

von Känel, R., Dimsdale, J. E., Ziegler, M. G., Mills, P. J., Patterson, T. L., Lee, S. K., & Grant, I. (2001). Effect of acute psychological stress on the hypercoagulable state in subjects (spousal caregivers of patients with Alzheimer's disease) with coronary or cerebrovascular disease and/or systemic hypertension. *American Journal of Cardiology, 87,* 1405–1408.

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,* 677–87.

Whitebird, R .R., Kreitzer, M. J., Crain, A. L., Lewis, B. A., Hanson, L. R., & Enstad, C. J. (2012). Mindfulness-Based Stress Reduction for family caregivers: A randomized controlled trial. *The Gerontologist, 53*, 676–686.

Whitebird, R .R., Kreitzer, M. J., Lewis, B. A., Hanson, L. R., Crain, A. L., Enstad, C. J., & Mehta, A. (2011). Recruiting and retaining family caregivers to a randomized controlled trial on Mindfulness-Based Stress Reduction. *Contemporary Clinical Trials, 32*, 654–661.

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.

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.