COPING WITH MULTIPLE SCLEROSIS: COPING STRATEGIES, PERSONALITY, AND COGNITIVE APPRAISALS AS PREDICTORS OF ADJUSTMENT AMONG MULTIPLE SCLEROSIS PATIENTS

DISSERTATION

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By
Holly McCartney Chalk, M. A.

* * * * *

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Dissertation Committee:
Dr. Don Dell, Adviser
Dr. Michael Browne
Dr. Pamela Highlen

Approved by
Adviser
Graduate Program in Psychology
ABSTRACT

Multiple sclerosis (MS) is an autoimmune disease which results in a wide variety of symptoms and extreme variability in disease course. Since researchers have not yet found a cure for the disease, MS patients experience a wide range of emotional responses to the uncertainty of their prognosis. Because MS patients’ level of subjective distress bears little relationship to the severity of their physical symptoms, I hypothesized that cognitive, behavioral, and dispositional variables likely play a role in psychosocial adjustment among MS patients.

Previous researchers have proposed two primary models by which coping, cognitive appraisals, and social support affect adjustment: the direct effects model and the stress buffering model. The direct effects model suggests that cognitive appraisals, social support, and coping strategies have direct effects on adjustment. The stress buffering model suggests that coping buffers the negative effects of cognitive appraisals on adjustment. I utilized structural equation modeling (SEM) procedures to assess the utility of these models in explaining adjustment to MS. This study extended previous research by investigating the value of incorporating personality variables into each of the models.

Correlational results indicated that coping and cognitive appraisals were systematically related to adjustment, while physical disability was not. This implies that
many of the variables which relate to adjustment outcomes among MS patients are controllable, suggesting that practitioners should target these cognitive and behavioral variables to positively affect adjustment to MS.

Regression analyses demonstrated that the addition of personality variables to the model improved predictive utility, suggesting that stress and coping researchers should attend to individual differences in the adjustment process. SEM results revealed that the best-fitting models of adjustment to MS included the direct effects of cognitive-behavioral and dispositional variables, as well as stress buffering effects. These findings suggest that comprehensive models of adjustment to MS should incorporate a combination of direct and stress buffering effects.

Particularly because no psychosocial intervention has been developed to specifically target MS patients, practitioners should utilize these results to develop effective interventions for this population. Specifically, results of the current investigation suggest that researchers should explore the utility of coping skills training and cognitive-behavioral therapy with the MS population.
DEDICATION

To my mother… You taught me that no matter what comes my way, I can overcome it. I admire your strong spirit, and I hope that I can show my children the unconditional love and support that you have always shown me. Thank you for believing in me.

To Jason… You helped me turn the scariest event in my life into a defining moment for my future. You showed me how to embrace my MS as a challenge – not just for me, but for us both. I never could have accomplished this without you, the calming force in my life. Thank you for keeping things in perspective, for encouraging me when I doubted myself, and for helping make my dreams come true. I love you.
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VITA

October 31, 1979…………………………… Born in Livingston, NJ

2001…………………………………………B.A. Psychology, Wake Forest University

2001-2002………………………………….. Graduate Research Associate, The Ohio State University

2002 – 2005…………………………………Graduate Teaching Associate, The Ohio State University

2004…………………………………………M.A., Psychology, The Ohio State University

2004…………………………………………Minor in Quantitative Psychology, The Ohio State University

2005-2006…………………………………University Fellowship, The Ohio State University

PUBLICATIONS


FIELDS OF STUDY

Major Field: Psychology
TABLE OF CONTENTS

Abstract .................................................................................................................. ii
Dedication .............................................................................................................. iv
Acknowledgments................................................................. ........................................... v
Vita............................................................................................................................. vi
List of tables ............................................................................................................. x
List of figures........................................................................................................... xii

Chapters:

1. Introduction........................................................................................................... 1

2. Literature Review................................................................................................ 10
   2.1. Stress & Coping ......................................................................................... 10
   2.2. Emotion-focused Coping & Outcome ...................................................... 11
   2.3. Problem-focused Coping & Outcome ...................................................... 13
   2.4. Cognitive Appraisals ............................................................................... 17
   2.5. Cognitive Appraisals & Coping ............................................................... 19
   2.6. Social Support............................................................................................ 20
   2.7. Social Support & Coping .......................................................................... 22
   2.8. Stress & Coping Model Applied to MS ...................................................... 23
   2.9. Personality.................................................................................................. 24
   2.10. Neuroticism ............................................................................................. 25
   2.11. Neuroticism & Coping ........................................................................... 26
   2.12. Neuroticism & Social Support ............................................................... 28
   2.13. Neuroticism & Appraisals ...................................................................... 29
   2.14. Extraversion ............................................................................................ 31
   2.15. Extraversion & Coping .......................................................................... 33
   2.16. Extraversion & Social Support ............................................................... 34
   2.17. Extraversion & Appraisals ...................................................................... 35
   2.18. The Present Study ................................................................................... 36

3. Method ................................................................................................................. 41
   3.1. A Priori Power Analysis .......................................................................... 41
   3.2. Population .................................................................................................. 42
   3.3. Sample........................................................................................................ 43
3.4. Procedures........................................................................................................... 47
3.5. Instruments.......................................................................................................... 49
   3.5.1 Demographic Questionnaire. .............................................................................. 49
   3.5.2 Self Administered Expanded Disability Status Scale ........................................ 49
   3.5.3 Coping with Multiple Sclerosis Scale................................................................. 51
   3.5.4 Big Five Inventory. ............................................................................................ 53
   3.5.5 Cognitive Appraisal of Health Scale................................................................. 55
   3.5.6 Social Support Questionnaire ............................................................................ 56
   3.5.7 The Satisfaction with Life Scale ......................................................................... 58
   3.5.8 Center for Epidemiologic Studies – Depression Scale ....................................... 59
   3.5.9 Beck Anxiety Inventory for Primary Care.......................................................... 61
   3.5.10 Mental Health Inventory. .................................................................................. 62
3.6 Data Analysis ........................................................................................................ 64
   3.6.1 Factor Analysis of the Coping with Multiple Sclerosis Scale .............................. 64
   3.6.2 Factor Analysis of the Big Five Inventory........................................................... 65
   3.6.3 Unrestricted Factor Analysis of Manifest Variables............................................. 67
   3.6.4 Structural Equation Modeling............................................................................ 68
3.7 Hypotheses............................................................................................................ 70
4. Results..................................................................................................................... 72
   4.1 Group Differences................................................................................................. 72
   4.2 Correlations.......................................................................................................... 77
   4.3 Regression Analysis............................................................................................. 83
   4.4 Factor Analysis of the Coping with Multiple Sclerosis Scale (Pakenham, 2001) 86
   4.5 Factor Analysis of the Big Five Inventory (BFI; John et. al, 1991) ....................... 91
   4.6 Unrestricted Factor Analysis of Manifest Variables............................................. 98
   4.7 Structural Equation Modeling............................................................................. 101
5. Discussion............................................................................................................... 114
   5.1 Influence of Controllable Factors ........................................................................ 115
   5.2 Importance of Incorporating Personality ........................................................... 117
   5.3 Direct Effects versus Buffering Effects ................................................................ 119
   5.4 Incorporating Direct and Buffering Effects .......................................................... 123
   5.5 Implications for Research & Practice ................................................................. 129
   5.6 Measurement Issues ........................................................................................... 133
   5.7 Internal & External Validity ................................................................................ 137
   5.8 Future Directions ............................................................................................... 140
6. Appendices............................................................................................................. 144
   A. Posting for list serves and message boards ......................................................... 144
   B. Solicitation e-mail ............................................................................................... 145
   C. Introductory webpage........................................................................................... 146
   D. Informed consent page ....................................................................................... 147
   E. Completion of study page ................................................................................... 148
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Demographic information for all participants</td>
<td>45</td>
</tr>
<tr>
<td>4.1</td>
<td>Means, standard deviations, and univariate $F$’s for dependent variables which yielded significant differences between groups based on gender.</td>
<td>74</td>
</tr>
<tr>
<td>4.2</td>
<td>Means, standard deviations, and univariate $F$’s for dependent variables which yielded significant differences between groups based on disease course.</td>
<td>76</td>
</tr>
<tr>
<td>4.3</td>
<td>Correlations between measures of coping, appraisal, personality, life satisfaction, depression, anxiety, mental health, and social support in the entire sample of MS patients.</td>
<td>78</td>
</tr>
<tr>
<td>4.4</td>
<td>Correlations between measures of coping, appraisal, personality, life satisfaction, depression, anxiety, mental health, and social support in individuals with progressive and relapsing-remitting MS.</td>
<td>81</td>
</tr>
<tr>
<td>4.5</td>
<td>Weights resulting from hierarchical regression analysis of independent variables on depression, anxiety, mental health, and life satisfaction.</td>
<td>84</td>
</tr>
<tr>
<td>4.6</td>
<td>Variance in adjustment outcomes that was accounted for by each set of predictor variables and corresponding $F$ value.</td>
<td>85</td>
</tr>
<tr>
<td>4.7</td>
<td>Rotated factor loadings of CMSS data based on the target matrix specified by the original validation of the scale.</td>
<td>87</td>
</tr>
<tr>
<td>4.8</td>
<td>Rotated factor loadings of CMSS data based on the target matrix specified by the first rotation of CMSS data in the current study.</td>
<td>89</td>
</tr>
<tr>
<td>4.9</td>
<td>Correlation between first order factors of the Coping with Multiple Sclerosis Scale (CMSS).</td>
<td>90</td>
</tr>
</tbody>
</table>
4.10. Fit indices for each EFA run on the correlation matrix of neuroticism items of the Big Five Inventory (BFI). ........................................ 91

4.11. Matrix of rotated factor loadings for EFA of neuroticism data when three factors were extracted utilizing the CF-Parsimax criterion. ..................... 93

4.12. Correlation between first order factors for neuroticism, as assessed by the Big Five Inventory (BFI). ................................................. 94

4.13. Fit indices for each EFA run on the correlation matrix of extraversion items of the Big Five Inventory (BFI). ............................................. 95

4.14. Matrix of rotated factor loadings for EFA of extraversion data when three factors were extracted utilizing the CF-Parsimax criterion. ..................... 96

4.15. Correlation between first order factors for extraversion, as assessed by the Big Five Inventory (BFI). ................................................. 97

4.16. Rotated factor loading matrix for unrestricted factor analysis of manifest variables onto latent factors. ......................................................... 99

4.17. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the traditional direct effects model .......... 102

4.18. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the traditional stress buffering model .......... 104

4.19. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the personality stress buffering model .......... 106

4.20. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the personality direct effects model .......... 108

4.21. Fit indices for the all models considered in SEM analyses ..................... 110

4.22. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the personality mixed model ..................... 111
# List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.1</td>
<td>Path diagram of the Traditional Direct Effects Model</td>
<td>169</td>
</tr>
<tr>
<td>S.2</td>
<td>Path diagram of the Traditional Stress Buffering Model</td>
<td>170</td>
</tr>
<tr>
<td>S.3</td>
<td>Path diagram of the Personality Direct Effects Model</td>
<td>171</td>
</tr>
<tr>
<td>S.4</td>
<td>Path diagram of the Personality Stress Buffering Model</td>
<td>172</td>
</tr>
<tr>
<td>S.5</td>
<td>Measurement model for the Traditional Direct Effects Model</td>
<td>173</td>
</tr>
<tr>
<td>S.6</td>
<td>Measurement model for the Traditional Stress Buffering Model</td>
<td>174</td>
</tr>
<tr>
<td>S.7</td>
<td>Measurement model for the Personality Direct Effects Model</td>
<td>175</td>
</tr>
<tr>
<td>S.8</td>
<td>Measurement model for the Personality Stress Buffering Model</td>
<td>176</td>
</tr>
<tr>
<td>S.9</td>
<td>Parameter estimates for the Personality Stress Buffering Model</td>
<td>177</td>
</tr>
<tr>
<td>S.10</td>
<td>Parameter estimates for the Personality Direct Effects Model</td>
<td>178</td>
</tr>
<tr>
<td>S.11</td>
<td>Path diagram of the Personality Mixed Effects Model</td>
<td>179</td>
</tr>
<tr>
<td>S.12</td>
<td>Measurement model for the Personality Mixed Effects Model</td>
<td>180</td>
</tr>
<tr>
<td>S.13</td>
<td>Parameter estimates for the Personality Mixed Effects Model</td>
<td>181</td>
</tr>
</tbody>
</table>
Multiple sclerosis (MS) is an autoimmune disease that affects the central nervous system. This chronic disease results in demyelination, breakdown of the fatty tissue which protects the nerve fibers and increases the speed of nerve impulses. While approximately 400,000 Americans currently live with MS, about 200 new cases are diagnosed every week in the United States. Worldwide, researchers expect that 2.5 million people suffer from this disease (National Multiple Sclerosis Society, October 2005).

With onset typically occurring during young adulthood, this disease often strikes individuals who have not previously dealt with major health concerns. Since the majority of MS patients are diagnosed between the ages of 20 and 40, they are often simultaneously dealing with a career and raising a family (Dupont, 1997). The unpredictable and stressful nature of MS renders the issue of coping particularly relevant to this population.

In addition to the unexpected timing of diagnosis, the course of the disease is highly unpredictable. Roughly 10-20% of patients are initially diagnosed with primary
progressive MS (PPMS), which involves continuous progression of disease symptoms with little or no periods of remission. The majority of MS patients (roughly 80%) are initially diagnosed with relapsing-remitting MS (RRMS), in which patients experience a series of relapses followed by complete or partial disappearance of symptoms (called remission). Approximately half of patients who are initially diagnosed with RRMS will develop secondary progressive MS (SPMS) within 10 years. Patients with SPMS stop experiencing relapses and begin a steady progression of disease symptoms (Reipert, 2004). Lastly, a small percentage of patients (roughly 5%) experience progressive relapsing MS (PRMS), which involves progressive deterioration from onset, with subsequent superimposed relapses (Kalb, 2003; Reipert, 2004; Tullman, Oshinsky, Lublin, & Cutter, 2004). Currently, no single clinical feature or diagnostic test has been found to accurately predict long-term disease progression.

Symptoms vary widely among patients. MS can result in sensory disturbances, difficulty walking, severe fatigue, emotional problems, decrease in cognitive function, pain, and vision problems (National Multiple Sclerosis Society, July 2004; Noseworthy, Lucchinetti, Roderiguez, & Weinshenker, 2000). Likely because the etiology of MS remains largely unknown, there exists no cure for the disease and only limited symptomatic relief (Rao, Huber, & Bornstein, 1992). Drug treatments exist to delay the progression of the disease; however, they are expensive and not effective for all patients (Paty, Hartung, Ebers, Soelberg-Sorensen, Abramsky, Kesselring, & Delwel, 1999).

The unpredictable nature of diagnosis, diversity of symptoms, extreme variability in disease course, and lack of a cure, all indicate that patients with MS likely experience a
range of emotional, behavioral, and social consequences (Vaughan, Morrison, & Miller, 2003). Several studies have reported that MS patients exhibit clinical depression more frequently than the general population (Arnett, Higginson, Voss, Randolph, & Grandey, 2002; Dupont, 1997; Ford, Gerry, Johnson, & Tenant, 2001; Smith, & Young, 2000). Researchers have found that depression affects up to 50% of MS patients during the course of their illness, which is three times the prevalence for depression reported in community based samples (Sadovnik, Remick, Allen, Swartz, Yee, Eisen, Farguhar, Hashimoto, Hooge, Kastrukoff, Morrison, Nelson, Oger, & Paty, 1996). Evidence suggests that this increased rate of depression among MS patients may contribute to the high suicide rate in this population, which has been found to be 7.5 times the rate of the age-matched general population (Sadovnick, Eisen, Ebers, & Paty, 1991). In addition, elevated rates of emotional disorders have been observed among MS patients, relative to other patient groups with comparable degrees of physical disability (Rao et al., 1992).

Although current knowledge about comorbid psychological disorders supports the notion that many individuals have difficulty dealing with multiple sclerosis, there are severely differing levels of distress among MS patients. Surprisingly, patients’ level of subjective distress bears little relationship to the severity of their physical symptoms (Warren, Warren, & Cockerill, 1991; Wineman, 1990). This suggests that some patients with MS may be better equipped than others to cope with the disease, regardless of disease severity. Research exploring factors associated with the ability to cope successfully with MS is essential.
The majority of psychological research with MS patients has explored the effects of various coping strategies on adjustment by examining problem-focused and emotion-focused coping strategies. The distinction between the two hinges on the focus of the coping response. Problem-focused coping involves actively seeking to resolve or alleviate the stressor. On the other hand, emotion-focused coping involves focusing only on managing the emotions associated with the stressor (Lazarus & Folkman, 1991; Parker & Endler, 1992).

Overall, research with MS patients suggests that emotion-focused coping is associated with negative adjustment outcomes; such as, increased depression and distress (Aikens, Fischer, Namey, & Rudick, 1997; Pakenham, 1999; Pakenham, Stewart, & Rogers, 1997), decreased life satisfaction (Eklund & MacDonald, 1991), and decreased quality of life (McCabe & McKern, 2002). However, research reporting the negative effects of emotion-focused coping has generally examined passive, avoidant means of emotion-focused coping (e.g., avoidance, wishful thinking, and self blame). Several MS researchers have found that more active, approach-oriented means of emotion-focused coping (e.g., acceptance, seeking emotional respite) are associated with positive outcomes (e.g., Brooks & Matson, 1982; Mohr, Goodkin, Gatto, & Van der Wende, 1997).

Some MS research suggests that utilization of problem-focused coping strategies is associated with positive outcomes; such as, decreased depression (Arnett et al., 2002), decreased distress (McCabe, McKern, & McDonald, 2004; Pakenham, 1999), and improved subjective health status (Pakenham, Stewart, & Rogers, 1997). Although the
positive effects of problem-focused coping have been demonstrated in some studies, many MS researchers fail to find significant relationship between problem-focused coping and adjustment (e.g., Beatty, Hames, Blanco, Williamson, Wilbanks, & Olson, 1998; Jean, Paul, & Beatty, 1999).

Conflicting results concerning the effects of emotion-focused and problem-focused coping strategies on adjustment in MS patients suggest that conceptualizing coping according to these two dimensions does not capture the true relationship between coping and adjustment in this population. Therefore, the current study utilized a MS-specific coping measure in order to more accurately assess the link between adjustment and coping with MS-related stressors.

In order to explain the contradictory evidence about the effects of various coping strategies, researchers have suggested that the effects of coping strategies are likely dependent upon other factors. Many researchers hold that problem-focused coping is most effective when an individual perceives the stressor to be within his or her control and that emotion-focused coping is most effective when the situation is perceived as uncontrollable (Compas, Malcarne, & Fondacaro, 1988; Folkman, 1984; Vitaliano, DeWolfe, Maiuro, Russo, & Katton, 1990). It follows logically that if a situation can be fixed, problem-focused coping should be most beneficial. If one cannot alter a situation, emotion-focused coping may be the best available option. However, it is important to note that the perception of controllability, not the actual controllability, influences the effectiveness of these different coping strategies.
Researchers refer to this perception of controllability as a cognitive appraisal. A cognitive appraisal is an evaluation of one’s resources to meet the demands of a stressful situation (whether one has the ability to handle or control the situation) (Lazarus & Folkman, 1984). Many researchers agree that appraisals are strong predictors of which coping strategies are used by an individual (Compas, Worsham, Ey, & Howell, 1996).

According to Lazarus and Folkman (1984), individuals who encounter a stressful situation appraise the circumstances in one of three ways. Challenge appraisals focus on the potential for growth that exists in the opportunity to overcome a difficult situation. These appraisals have been associated with positive outcomes (Maier, Waldstein, & Synowski, 2003; Wlodarczyk, 2001). Harm appraisals concentrate on the damage that has already occurred as a result of a stressful situation, and threat appraisals focus on damage that will occur to the individual as a result of the threatening situation. Harm and threat appraisals have been associated with negative adjustment outcomes (Lazarus & Folkman, 1984; Tomaka, Blascovich, Kelsey, & Leitten, 1993).

Both aspects of the situation and aspects of the individual affect how a situation is appraised (Lazarus & Folkman, 1984). According to Lazarus & Folkman (1984), the three situational variables most likely to result in threat appraisals are novelty, unpredictability, and uncertainty. As mentioned previously, dealing with multiple sclerosis involves all of these factors. Therefore, MS patients are particularly at risk for utilizing threat appraisals. Research addressing cognitive appraisals of controllability is particularly necessary with this population. Because MS patients cannot control the
situational factors of the disease or their exacerbations, the present study will focus on aspects of the individual that are associated with threat and harm appraisals.

Despite the relationship between coping and appraisals, individual differences in coping and adjustment persist which cannot be explained by cognitive appraisals. The research indicates that these individual differences may be explained by personality variables (Bolger & Zuckerman, 1995; Hewitt & Flett, 1996). Theoretically, we should expect personality to prove influential in any model of stress and coping. Recall that coping refers to how an individual responds to a stressful event (Lazarus & Folkman, 1984). Personality traits are individual differences in the tendencies to show consistent patterns of thoughts, feelings, and actions across situations (McCrae & Costa, 1990). It is reasonable to assume that an individual’s responses to stressful situations, including coping mechanisms and appraisals, would be influenced by stable personality traits.

The primary personality traits that have been explored in relation to coping are neuroticism and extraversion. A good deal of research supports the notion that high levels of neuroticism are associated with maladaptive coping strategies, such as hostile or avoidance coping (McCrae & Costa, 1986; Smith, Pope, Rhodewalt, & Poulton, 1989) and threat appraisals (Hemenover & Dienstbier, 1996, 1998; Penley & Tomaka, 2002). Neuroticism has also been associated with negative adjustment outcomes among patients with chronic illness or injury (Bosma, Sanderman, Scaf-Klomp, Van Eijk, Ormel, & Kempen, 2004; Taillefer, Kirmayer, Robbins, & Lasry, 2003). Conversely, extraversion has been associated with increased problem-focused coping, which has been related to positive adjustment outcomes (McCrae & Costa, 1986; Watson & Hubbard,
Although more research is needed to delineate the relationships between personality, coping, and adjustment, research on neuroticism and extraversion provides ample evidence that personality influences coping and appraisals, and thus should be explored further.

To date, two primary models have been examined to illuminate the effects of stress and coping on adjustment. The direct effects model suggests that cognitive appraisals, social support, and coping strategies have direct effects on adjustment (Aldwin & Revenson, 1987; Cohen & Wills, 1985). This model has proven to be accurate in a variety of disease populations (Pakenham, Dadds, & Terry, 1994; Thompson, Gil, Abrams, & Phillips, 1992). Pakenham (1999) found significant support for the direct effects model among MS patients.

Another model which is often explored, the stress buffering model, suggests that coping buffers the negative effects of cognitive appraisals on adjustment. This model purports that the negative consequences of harmful appraisals are only evident at high levels of stress, because effective coping strategies reduce the negative effects of harmful appraisals in most situations (Finney, Mitchell, Cronkite, & Moos, 1984). Although little research exists examining the stress buffering model, Pakenham (1999) reports limited support for this model in the MS population.

Similar to previous research, the present study will examine how social support, cognitive appraisals, and coping strategies affect the relationship between illness stressors and adjustment outcomes. I will assess the utility of the traditional direct effects model (see Figure S.1) and the traditional stress buffering model (see Figure S.2) in explaining
adjustment in the current study. Additionally, this study will extend previous findings by exploring how personality variables affect stress and coping models.

I will examine the direct effects of personality variables on adjustment by incorporating extraversion and neuroticism into the direct effects model (see Figure S.3; Personality Direct Effects Model). However, it is hypothesized that personality variables will more significantly affect the stress and coping model by directly influencing cognitive appraisals, social support, and coping strategies, thereby indirectly affecting adjustment (see Figure S.4; Personality Stress Buffering Model).

Despite the apparent need for exploration of coping among MS patients, few studies have examined factors associated with successful coping in this population. Especially because no cure has been found for multiple sclerosis, it is important to explore factors that lead to successful coping for these patients. The results of this study will be particularly useful to caregivers and professionals working with MS patients. Delineating which variables are associated with positive psychological adjustment will enable caregivers to encourage the use of coping strategies, cognitive appraisals, and social support that will lead to positive outcomes. Furthermore, this research will allow practitioners to encourage the expression of personality traits that are associated with effective coping in the MS population.
2.1 Stress & Coping

Because stress is a universal human experience, investigators have devoted a great deal of research to exploring the optimal methods to cope with stress. Contemporary theorists hold that stress is any relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources, thereby endangering well-being (Lazarus & Folkman, 1984). When confronted with a situation that may overwhelm one’s resources, an individual utilizes a variety of strategies to combat the situation. Researchers refer to these efforts as coping strategies.

The most frequently cited definition of coping comes from Lazarus and Folkman’s 1984 text, holding that coping refers to “constantly changing cognitive and behavioral efforts to manage specific external or internal demands that are appraised as taxing or exceeding the resources of the person” (p. 141). Although countless alternative definitions have been proposed, this definition encompasses the key point that coping involves both cognitive and behavioral response made by individuals who encounter situations which they perceive as threatening (Silver & Wortman, 1980).
The literature contains numerous distinctions between different coping styles; however, the majority of research with MS patients has examined problem-focused and emotion-focused coping. While both may involve behavioral, cognitive, or emotional responses to stressful situations, the focus of the coping behavior differs. When an individual who is coping with a stressful situation addresses the problem and makes efforts to actively resolve it, he or she is using problem-focused coping. Problem-focused coping strategies include defining the problem, generating alternative solutions, weighing alternatives and choosing among them, learning new skills, and shifting goals to meet demands. If the individual focuses only on managing the emotions associated with the stressor, that person is utilizing emotion-focused coping. Emotion-focused coping strategies seek to reduce stress by utilizing responses such as daydreaming, distracting oneself, seeking emotional support, venting, or regulating one’s emotions (Lazarus & Folkman, 1984; Parker & Endler, 1992).

Researchers must be careful not to label any given coping strategy as inherently good or bad, because the effects of coping strategies depend, at least in part, on situational factors. However, stress and coping research has shown that some coping strategies generally lead to more positive outcomes.

2.2 Emotion-focused Coping & Outcome

The majority of studies examining coping among multiple sclerosis (MS) patients have found that emotion-focused coping strategies are associated with negative adjustment outcomes; such as, increased depression and distress (Aikens et al., 1997;
Beatty et al., 1998; Pakenham et al., 1997; Pakenham, 1999), decreased life satisfaction (Eklund & MacDonald, 1991), and decreased quality of life (McCabe & McKern, 2002). Pakenham et al. (1997) reported that reliance on avoidance, an emotion-focused coping strategy, was related to decreased global health and social adjustment among MS patients. In addition, Pakenham et al. (1997) found that the emotion-focused coping strategies of dependence and wishful thinking were related to greater emotional distress among MS patients. More recently, McCabe & McKern (2002) reported that several emotion-focused coping strategies, especially wishful thinking, were negatively associated with both objective and subjective quality of life among MS patients.

Cross-sectional studies have found that several emotion-focused strategies, such as wishful thinking and avoidance, are related to poor outcomes (Aikens et al., 1997; Eklund & MacDonald, 1991; Jean et al., 1999; O’Brien, 1993). In a study of MS patients who had been living with the disease for an average of 16.5 years, Eklund & MacDonald (1991) demonstrated that patients who did not cope effectively with MS (as defined by lower life satisfaction, emotional functioning, and self-esteem) reported increased reliance on emotion-focused coping strategies (e.g., avoidance and obsession).

Longitudinal studies have also found that emotion-focused coping is related to poor outcomes (Aikens et al., 1997; Pakenham, 1999). Aikens et al. (1997) demonstrated that use of avoidance coping, an emotion-focused coping strategy, predicted future depressed mood among MS patients at 6 and 12 month follow-up assessments. In a similar 12-month study, Pakenham (1999) demonstrated that less reliance on emotion-
focused coping was associated with improvements in depression, global distress, social adjustment, and subjective health status.

Despite the wealth of research associating emotion-focused coping strategies with negative adjustment outcomes, some studies provide contradictory evidence (e.g., Brooks & Matson, 1982). This may be due to the fact that research reporting the negative effects of emotion-focused coping has generally examined passive, avoidant means of emotion-focused coping (e.g., avoidance, wishful thinking, and self blame). Several MS researchers have found that more active, approach-oriented means of emotion-focused coping (e.g., acceptance, seeking emotional respite, cognitive reframing) are associated with positive outcomes (e.g., Mohr et al., 1997). For example, Brooks and Matson (1982) reported that MS patients who coped through acceptance (an active emotion-focused strategy) showed improved self concept; however, those who relied on religion or seeking family support (passive emotion-focused strategies) experienced more negative self concept.

2.3 Problem-focused Coping & Outcome

Some of the research with MS patients has associated frequent use of problem-focused coping strategies with improved psychological well-being, both cross-sectionally (Arnett et al., 2002; O’Brien, 1993; Pakenham et al., 1997) and longitudinally (Pakenham, 1999). Arnett et al. (2002) found that active, problem-focused coping moderated the relationship between cognitive dysfunction and depression; such that, cognitive dysfunction experienced by MS patients was less likely to be associated with
depression if the patient engaged in high levels of problem-focused coping. Longitudinal research lends support to the notion that problem-focused coping may be predictive of future positive adjustment. In a 12 month study, Pakenham (1999) reported that lower levels of depression and distress among MS patients were predicted by greater reliance on problem-focused coping.

Some neurological research has linked problem-focused coping with improvements in physical symptoms of MS. Mohr, Goodkin, Nelson, Cox, and Weiner (2002) reported that increased use of instrumental, or problem-focused, coping was associated with a moderately decreased relationship between stress and new lesions; such that MS patients who used instrumental coping were less likely to demonstrate new brain lesions in response to stress. Researchers have also demonstrated a link between disease activity and problem-focused coping; such that, MS patients who are currently experiencing an exacerbation of disease activity are less likely to rely on problem-focused strategies and more likely to experience distress (Warren et al., 1991).

Despite some supporting research, the direct relationship between problem-focused coping and adjustment remains unclear because many studies provide conflicting evidence (Aikens et al., 1997; McCabe et al., 2004; Pakenham et al., 1997). Pakenham and colleagues (1997) reported that problem-focused coping was related to better subjective health status among MS patients, but was unrelated to distress, depression, or social adjustment. McCabe et al. (2004) found that frequent use of problem-focused coping was associated with lower levels of depression and tension among male MS patients. However, this relationship did not hold for females in this study. Many other
researchers have failed to find any significant relationship between problem-focused coping and outcome measures (e.g., Beatty et al., 1998; Jean et al., 1999).

Conflicting evidence concerning the effects of emotion-focused and problem-focused coping in MS patients suggests that conceptualizing coping according to these two dimensions does not capture the true relationship between coping and adjustment in this population. Although MS researchers have historically utilized coping measures which identify problem-focused and emotion-focused coping strategies (e.g., Ways of Coping Checklist; Vitaliano, Russo, Carr, Maiuro, & Becker, 1985), some researchers argue that instruments which were developed for the general population do not include the diversity of strategies used to cope with multiple sclerosis (Maes, Leventhal, DeRidder, 1996; Pakenham, 2001).

In response to this criticism, Pakenham (2001) developed the Coping with Multiple Sclerosis Scale (CMSS), an instrument that assesses seven coping responses to MS-related stressors (including subscales for problem solving, physical assistance, acceptance, avoidance, personal health control, energy conservation, and emotional release). Each CMSS subscale, with the exception of physical assistance, significantly correlated with two different subscales of the Ways of Coping Checklist (WCC; Vitaliano et al., 1985) in the validation study (Pakenham, 2001). However, these correlations did not coincide with the problem-focused and emotion-focused distinctions used by the WCC. For example, the acceptance subscale of the CMSS positively correlated with wishful thinking (an emotion-focused WCC subscale) and problem solving (a problem-focused WCC subscale). Pakenham (2001) suggests that these contradictions indicate
that the CMSS captures nuances within coping with MS that have been overlooked by previous measures. Furthermore, low correlations between the several CMSS subscales (particularly physical assistance or energy conservation) and previous coping measures suggests that people dealing with MS-related stressors exhibit a variety of distinct coping responses which must be considered when assessing stress and coping in this population.

In the validation study, Pakenham (2001) found that increased reliance on problem solving, acceptance, and physical assistance coping was associated with positive adjustment outcomes (e.g., lower depression and distress, better dyadic adjustment with caregivers). Negative adjustment outcomes (e.g., increased distress, decreased subjective health status, and decreased social adjustment) were linked to energy conservation, emotional release, personal health control, and avoidance. By considering diverse categories of coping, Pakenham (2001) found stronger evidence for the direct relationship between certain coping strategies and adjustment than previous MS researchers have reported.

For this reason, it was expected that coping, as assessed by the CMSS, would demonstrate a direct relationship with psychological adjustment among MS patients in the current investigation. While I expected that the utilization of an MS-specific coping measure would likely improve the predictive utility of stress and coping models, prior research suggested that a host of other variables would likely influence the effectiveness of various coping strategies.
2.4 Cognitive Appraisals

The purpose of coping responses is to alleviate the psychological distress which arises from exposure to stressful situations. Therefore, successful coping involves utilization of coping strategies that are appropriate to that individual’s resources and the situation (Lazarus & Folkman, 1984). A good deal of research suggests that problem-focused coping is most effective when an individual perceives the stressor to be within his or her control and that emotion-focused coping is most effective when the situation is perceived as uncontrollable (Compas et al., 1988; Lazarus & Folkman, 1984; Vitaliano et al., 1990). These studies demonstrate that the perception of controllability, not the actual controllability, influences the effectiveness of various coping strategies.

This perception of controllability is referred to as a cognitive appraisal. According to Lazarus & Folkman (1984), a cognitive appraisal is an individual’s evaluation of whether an encounter with the environment is relevant to his or her well-being, and if so, how it is relevant. The type of cognitive appraisal experienced in reaction to a stressful situation depends on the individual’s evaluation of his or her resources to meet the demands of the situation.

Individuals who encounter a stressful situation appraise the circumstance in one of three ways: they utilize challenge, harm, or threat appraisals (Lazarus & Folkman, 1984). Challenge appraisals occur when an individual perceives that his or her coping ability exceeds situational demands, rendering it challenging. Challenge appraisals have been associated with increased positive affect, increased task engagement, and decreased depressive symptoms in the general population (Maier et al., 2003; Mak, Blewitt, &
Heaven, 2004). The direct positive effects of challenge appraisals on adjustment have been demonstrated in some research with illness populations. Meredith, Strong, and Feeney (2005) found decreased emotional distress among chronic pain patients who utilized more challenge appraisals. Reliance on challenge appraisals has also been related to significantly lower levels of distress among MS patients (Wineman, Durand, & Steiner, 1994). However, numerous studies which explored cognitive appraisals among MS patients have failed to find a significant direct relationship between challenge appraisals and adjustment outcomes (e.g., Pakenham et al., 1997; Pakenham, 1999).

While challenge appraisals are generally linked to positive outcomes, harm and threat appraisals are associated with negative outcomes. Individuals use harm appraisals when they perceive that some damage has already occurred as a result of the stressful event. If the individual perceives that the demands of the stressful situation exceed his or her coping ability, rendering it harmful and unavoidable, the individual will utilize a threat appraisal (Lazarus & Folkman, 1984). Harm and threat appraisals have been associated with negative adjustment outcomes in a variety of adult populations (Lazarus & Folkman, 1984; Tomaka et al., 1993). To date, researchers have not isolated the effects of harm appraisals in MS patients. The majority of MS research which explores the effects of cognitive appraisals on adjustment considers harm and threat appraisals together, labeling them stress appraisals. Utilizing this conceptualization, Pakenham (2005) found that stress appraisals are related to higher levels of depression and anxiety among MS patients, while also correlating with lower levels of life satisfaction in this population. Pakenham (2005) reported that increased stress appraisals significantly
predicted increased global distress and negative adjustment, while predicting decreased life satisfaction and positive affect.

Among MS patients, reliance on threat appraisals has been directly linked to global distress, depression, negative affect, perceived stress and poor social adjustment (Maier et al., 2003; Pakenham et al., 1997; Pakenham, 1999; Wineman et al., 1994). Researchers have also demonstrated a direct link between threat appraisals and adjustment among caregivers of patients with MS (Pakenham, 2001a). Given the research support for the notion that harm and threat appraisals directly affect adjustment, and the conflicting evidence about whether challenge appraisals have direct adjustment effects, I expected that the direct effect of cognitive appraisals on adjustment would be minimal in the current study, and that this relationship would be better explained by the mediating effects of coping.

2.5 Cognitive Appraisals & Coping

While the direct relationship between challenge appraisals and adjustment remains questionable, research support exists for the buffering effect of coping on challenge appraisals. This buffering hypothesis purports that cognitive appraisals influence the choice of coping strategies, as well as the extent to which coping strategies are effective. Use of challenge appraisals has been related to decreased use of catastrophizing coping (Meredith et al., 2005) and increased use of positive self-statements to cope with chronic pain (Unruh, Ritchie, & Merskey, 1999). Research also supports the notion that cognitive appraisals influence coping effectiveness. Wlodarczyk
(2001) found that challenge appraisals were associated with increased effectiveness of psychological coping among patients with myocardial infarction.

Some MS research lends support to the notion that coping has a buffering effect on the relationship between harm/threat appraisals and adjustment, such that coping is a mediating factor between harm/threat appraisals and outcome variables. Threat appraisals have been associated with increased reliance on catastrophizing as a coping strategy in patients dealing with chronic pain (Meredith et al., 2005; Unruh et al., 1999). Wineman et al. (1994) found that MS patients who utilized harm/threat appraisals utilized more emotion focused coping, which subsequently was associated with increased distress. In addition to the relationship between cognitive appraisals and choice of coping strategy, researchers have demonstrated that use of threat/harm appraisals lowers the effectiveness of coping strategies (e.g., Wlodarczyk, 2001).

Although cognitive appraisals have some direct relationship to adjustment, many researchers agree that appraisals are strong predictors of which coping strategies are used by an individual and how effective those strategies are. Therefore, I hypothesized that coping would mediate the relationship between cognitive appraisals and adjustment outcomes among MS patients in the current investigation.

2.6 Social Support

Predominant coping researchers agree that social support is a critical element of a comprehensive model of stress and coping (e.g., Lazarus & Folkman, 1984; Schreurs & deRidder, 1997; Valentiner, Holahan, & Moos, 1994). While some researchers examine
seeking social support as a coping strategy, most incorporate social support into stress and coping models as a coping resource. Using this conceptualization, social support is considered to be a relatively stable characteristic of an individual’s environment that is available to help the person cope with stress (Moos & Billings, 1982). Social support is a multifaceted construct which incorporates not only the mere existence of social relationships, but also the functional value of social interactions. MS researchers have identified the importance of aid, assistance, affirmation, and affection in order for social interactions to be considered social support (Gulick, 1994).

Researchers have demonstrated that social support is an important factor in helping MS patients cope with their symptoms and diagnosis (Miller, 1997). High levels of social support have been associated with decreased psychological distress, increased self-esteem, and improved quality of life among MS patients (Foote, Piazza, Holcombe, Paul, & Daffin, 1990; Miller, 1997; Schwartz & Frohner, 2005). Long and Miller (1991) demonstrated that increased family support was linked to decreased risk for suicide among MS patients, while McCabe et al. (2004) found that social support predicted decreased depression and tension in this population. Furthermore, failure to seek social support was associated with poor psychological adjustment among MS patients (McCabe et al., 2004). Longitudinal research supports the notion that social support leads to positive adjustment. Pakenhan (1999) found that the perceived availability, frequency, and usefulness of social support to MS patients significantly predicted decreased depression at a 12-month follow up assessment. Evidence that social support is linked to
subsequent adjustment suggests that increases in social support may have causal implications for future adjustment.

MS caregiving research indicates that high levels of social support also improve adjustment among family members of MS patients. Researchers have found that strong social support predicts decreased depression and psychological distress in family members who provide care for MS patients (Carnes & Quinn, 2005; Pakenham, 2001a). O’Brien, Wineman, and Nealon (1995) demonstrated that social support significantly predicted MS caregivers' general health, mood, and family satisfaction. Research also suggests that social support may have positive effects on family dynamics. Carnes & Quinn (2005) found that consistent social support predicted improved functioning in families coping with MS. In accordance with the literature, I hypothesized that social support would demonstrate a direct positive relationship with adjustment; such that higher levels of social support would be associated with positive adjustment outcomes.

2.7 Social Support & Coping

While the direct relationship between social support and adjustment among MS patients is consistently supported by empirical research, little consensus exists among studies exploring the relationship between social support and coping. Some chronic illness researchers have demonstrated a direct link between social support and coping. The availability of social support has been associated with increased use of cognitive restructuring and reliance on religion among cancer patients (Ell, Mantell, Hamovitch, & Nishomoto, 1989), as well as increased approach coping among cardiac disease patients.
These findings suggest that social support may affect adjustment indirectly, through coping. However, other researchers report conflicting results.

Although Bennett (1993) demonstrated that perceived availability of social support enhanced effectiveness of coping among patients with myocardial infarction, coping effectiveness was unrelated to choice of coping strategy in this study. This suggests that while the availability of social support might influence coping effectiveness, there may be no direct relationship between social support and choice of coping strategy. Behen and Rodrigue (1994) found that neither the perceived availability of social support nor satisfaction with social support was associated with choice of coping strategy among cancer patients. Although little MS research has explored social support as a coping resource, existing research with MS patients has failed to find evidence for a significant relationship between social support and coping (e.g., O’Brien, 1993). Because no evidence exists for a link between social support and coping among MS patients, I expected that social support would not directly influence coping, and instead, would directly affect adjustment in the present study.

2.8 Stress & Coping Model Applied to MS

Although researchers agree that psychosocial factors influence adjustment to MS, relatively few studies have examined a model of how coping with the disease impacts psychosocial adjustment. Studies exploring these issues have based their hypotheses on Lazarus and Folkman’s (1984) model of stress, appraisal, and coping (e.g., Knight,
Devereux, and Godfrey, 1997; Pakenham, 1999, 2001; Pakenham et al., 1997; Vanderplate, 1984). Pakenham (1999) utilized a disease-specific model, which holds that adjustment to chronic illness is affected by illness parameters, cognitive appraisals, social support, and coping strategies. Although Pakenham’s (1999) model explains a significant amount of variation in adjustment to MS, individual differences exist in adjustment to MS which cannot be explained by the variables in Pakenham’s (1999) model. According to Lazarus and Folkman (1984), both situational factors and individual difference variables affect the relationship between stress and outcome. Therefore, I anticipated that these individual differences in the stress and coping model may be explained, at least in part, by personality variables.

2.9 Personality

Personality variables reflect patterns of thoughts, feelings, and actions that are relatively stable over time and across situations (McCrae & Costa, 1990, p.23). Research supports the notion that an individual’s responses to stressful situations, including coping mechanisms and appraisals, are influenced by stable personality traits (e.g., Costa & McCrae, 1996; Hewitt & Flett, 1996). Although several personality theories exist, Costa & McCrae’s Big Five trait approach to personality has received the most attention. McCrae and Costa conceptualize personality along five dimensions; including, neuroticism, extraversion, openness, agreeableness, and conscientiousness (Costa, Somerfield, & McCrae, 1996). Because insufficient evidence exists to predict relationships between openness, agreeableness, or consciousnesses and coping or
adjustment among MS patients, the present investigation considered only neuroticism and extraversion in the proposed models.

2.10 Neuroticism

Neuroticism refers to the tendency to experience anxiety, tension, instability, worry, self-defeating thoughts, self-consciousness, and hostility (McCrae & John, 1992). A good deal of health-related research has explored the extent to which neuroticism influences the perception of physical symptoms. Strong associations have been found between neuroticism and health complaints, health habits, and illness behavior (Costa & McCrae, 1985; Friedman & Booth-Kewley, 2003). Other research suggests that neuroticism is strongly related to subjective health complaints, but unrelated to objectively determined health status (Costa & McCrae, 1987). Because the assessment of multiple sclerosis relies heavily on subjective reports of symptoms which are influenced by neuroticism, examination of this trait among MS patients could prove to be informative in assessment and treatment of this population. Furthermore, given that MS patients report significantly higher levels of neuroticism than healthy controls (Gatten, Brookings, & Bolton, 1993; Johnson, DeLuca, & Natelson, 1996), models of adjustment to MS should consider the unique effects of neuroticism in this population.

Research with a wide variety of health-related populations indicates that neuroticism is related to various physical and psychological aspects of adjustment; including, pain, depression, and anxiety (Bosma et al., 2004; Nitch, & Boone, 2004). Neuroticism also explains a significant amount of variation in disability (e.g., days of
work missed), somatization (e.g., medically unexplained symptoms), and subjective pain (e.g., severity and interference) among primary care patients (Russo, Katon, Lin, & Von Korff, 1997). Longitudinal research with older adults suggests that neuroticism significantly predicts increased risk of depression later in life (Ormel, Oldekinkel, & Brilman, 2001).

Although research exploring the relationship between personality and adjustment in MS patients is lacking, researchers have demonstrated that neuroticism is positively correlated with depression (Taileffer, et al., 2003) and fatigue (Merkelbach, Konig, & Süttinger, 2003) among MS patients. For this reason, I propose that a comprehensive model of coping with MS-related stressors should include a mechanism by which neuroticism affects adjustment among MS patients. Although the research suggests a strong relationship between neuroticism and adjustment, it was expected that this relationship could be explained by several mediating variables in the current investigation (including coping, cognitive appraisals, and social support).

2.11 Neuroticism & Coping

While a good deal of research supports the notion that neuroticism directly affects adjustment, many researchers agree that neuroticism also indirectly affects adjustment by influencing coping choice and coping effectiveness (Bolger & Zuckerman, 1995). Across numerous studies, neuroticism has been associated with increased use of emotion-focused coping. High levels of neuroticism have been used to predict reliance on various emotion-focused strategies; such as, escape-avoidance and emotional venting (O'Brien &
DeLongis, 1996; Watson & Hubbard, 1996). McCrae and Costa (1986) report significant correlations between neuroticism and emotion-focused coping strategies such as, hostile reactions, escape fantasies, self-blame, sedation, withdrawal, wishful thinking, passivity, and indecisiveness. In this study, McCrae and Costa (1986) found that participants who score high on neuroticism tended to use the least effective coping strategies, as determined by subjective ratings of effectiveness across participants. In a longitudinal study, Bolger and Schilling (1991) reported that 54% of the effect of neuroticism on anxiety was explained by the use of emotion-focused coping strategies such as wishful thinking and self blame.

This relationship has also been demonstrated among chronic illness patients. High levels of neuroticism among caregivers of children with chronic disabilities correlated with use of emotion-focused coping (Patrick & Hayden, 1999). Several studies have demonstrated that caregivers of people with Alzheimer’s disease who were high in neuroticism were more likely to rely on emotion-focused coping strategies (Hooker, Frazier, and Monohan, 1994; Rose, Strauss, Neundorfer, Smyth, & Stuckey, 1997). Patients coping with chronic pain also demonstrate this relationship between neuroticism and emotion-focused coping. Williams, Robinson, and Geisser (1994) found a positive correlation between neuroticism and self-blame about pain-related stress. In a study of rheumatoid arthritis, Affleck, Urrows, Tennen, and Higgings (1992) reported that neuroticism predicted the use of emotional support and relaxation to cope with chronic pain.
Research exploring the relationship between coping and neuroticism in MS patients is limited; however, Ratsep and colleagues reported that the neuroticism was significantly correlated with emotion-focused coping in MS patients in their study and that this correlation was higher among MS patients than healthy controls (Ratsep, Kallasmaa, Pulver, & Gross-Paju, 2000). Therefore, I anticipated that neuroticism would indirectly affect adjustment by influencing choice of coping strategy and coping effectiveness in the present study.

2.12 Neuroticism & Social Support

In addition to the effects of neuroticism on coping, I hypothesized that neuroticism should indirectly affect adjustment by influencing social support. Research supports this buffering hypothesis, which states that individuals who are high in neuroticism should attract lower levels of social support from their environment. In the general population of adults, high levels of neuroticism have been associated with decreased availability, frequency, and quality of social support (Kitamura, Watanabe, Takara, Hiyama, Yasumiya, & Fujihara, 2002; Maiden, Peterson, Caya, & Hayslip, 2003). Path analysis has been used to demonstrate that increased neuroticism predicts decreased intimate support, which is an essential component of social support (Horner, 2001). Longitudinal data also support the notion that increased neuroticism is associated with decreased social support. Kokkonen and Pulkkinen (2001) found that participants’ level of neuroticism at age 33 was correlated with the emotional support they reported.
receiving three years later. These results indicated that one’s current level of neuroticism may be used to predict one’s subsequent receipt of, and satisfaction with, social support.

The relationship between neuroticism and social support has been demonstrated in chronically ill populations. Ybema and colleagues found that neuroticism was significantly related to underbenefit among cancer patients, which indicates that patients who were high on neuroticism were more likely to report that they were receiving inadequate support from the relationship with their significant other (Ybema, Kuijer, Buunk, DeJong, & Sanderman, 2001). Patients in this study who scored high on neuroticism were also less likely to provide social support to others, further increasing the likelihood that they would receive inadequate support (Ybema et al., 2001).

Even though the direct relationship between neuroticism and social support has not been explored among MS patients, the association between these constructs in other populations provides sufficient evidence to expect a significant relationship between these variables. Consequently, I expected that the current investigation would lend support to the buffering hypothesis, that neuroticism affects adjustment indirectly by influencing the social support received by MS patients.

2.13 Neuroticism & Appraisals

Evidence suggests that neuroticism may also indirectly affect adjustment by influencing cognitive appraisals. Neuroticism has been associated with harm and threat appraisals in the general population (Mak et al., 2004; Penley & Tomaka, 2002; Shewchuk, Elliott, MacNair-Semands, & Harkins, 1999). Several researchers have
indicated that individuals high in neuroticism have a tendency to interpret ambiguous stimuli as threatening, and therefore, are more prone to threat appraisals (Hemenover & Dienstbier, 1996, 1998; Watson & Clark, 1984). In a study on pain-related beliefs, Williams and colleagues (1994) found that individuals who scored high on neuroticism held stronger beliefs that their pain had a “mystical nature” and would endure for a long time. These findings suggest that individuals who score high on neuroticism tend to appraise situations as uncontrollable, and therefore, utilize threat appraisals.

Gallagher (1990) demonstrated that neuroticism was positively associated with threat appraisals and negatively associated with challenge appraisals among college undergraduates. The combination of neuroticism and threat appraisals resulted in the most extreme negative outcomes in this study; such as, low confidence, high worry, and fear. Gallagher (1990) argued that individuals high on neuroticism constantly tax their coping resources with negative, anxiety-provoking thoughts. This explains why individuals who are high on neuroticism are more likely to evaluate their remaining resources to be inadequate. Mak et al. (2004) replicated these results, finding that neuroticism was associated with greater reliance on threat appraisals and that both were strong predictors of depression in the general population.

Researchers have not explored the direct association between neuroticism and cognitive appraisals among MS patients. However, Taileffer and colleagues (2003) found that neuroticism significantly predicted illness worry in MS patients, indicating that patients who are high on neuroticism are more likely to worry about the implications of their symptoms and tend to expect the worst when they get sick. Consequently, I
expected that MS patients in the current study who indicated high levels of neuroticism would be more likely to use harm and threat appraisals, yielding a direct relationship between neuroticism and cognitive appraisals and an indirect influence of neuroticism on adjustment.

2.14 Extraversion

Extraversion refers to the tendency to be active, positive, assertive, enthusiastic, talkative, and outgoing (McCrae & John, 1992; Watson & Clark, 1997). Health-related research suggests that extraversion is associated with positive health outcomes, such as perception of decreased illness symptoms and improved subjective health status (Barger, 2006; Korotkov & Hannah, 2004; Merkelbach et al., 2003). Given that the assessment of MS depends heavily on patients’ subjective reports of disease symptoms which are influenced by extraversion, it is expected that exploring the effects of this trait will inform the assessment of MS patients. In addition, because MS patients indicate significantly lower levels of extraversion than the healthy adult populations (Gatten et al., 1993), models of adjustment to MS should consider the unique effects of extraversion among MS patients.

Low levels of extraversion have been associated with a variety of negative adjustment outcomes in healthy adult populations; such as increased incidence of anxiety disorders (Bienvenu, Samuels, Costa, Reti, Eaton, & Nestadt, 2004), increased depressive symptoms (Chioqueta & Stiles, 2005), and poor health outcomes (Maiden et al., 2003). Extraversion was found to be protective against suicidal ideation in bipolar patients with
and without a history of previous suicide attempts (Allen, Chessick, Miklowitz, Goldberg, Wisniewski, Miyahara, Calabrese, Marangell, Bauer, Thomas, Bowden, & Sachs, 2005). Among chronic pain patients, Nitch and Boone (2004) found that those who are more extroverted tend to report lower levels of pain and distress.

In a review of the personality and depression literature, Enns & Cox (1997) conclude that the effects of extraversion on outcome are less robust than those of neuroticism. The authors report that while some research has associated low levels of extraversion with poor prognosis among patients with major depression, many studies have failed to find a significant relationship between the two (Coryell, Winokur, Maser, Akiskal, Keller, & Endicott, 1994; Joffe, Levitt, Bagby, & Regan, 1993; Russo et al., 1997).

While high levels of extraversion have been associated with increased fatigue among MS patients (Merkelbach et al., 2003), few MS studies have found evidence of a significant direct relationship between extraversion and outcome variables. The majority of MS research has investigated the mechanisms by which extraversion affects outcome indirectly (e.g., through coping and social support). Given these findings, I contend that a comprehensive model of coping with MS-related stressors should include a mechanism by which extraversion affects adjustment among MS patients. Although I expected that the direct effect of extraversion on outcome in the current investigation would be negligible, I anticipated that extraversion would influence adjustment indirectly by affecting coping and social support.
2.15 Extraversion & Coping

Researchers purport that extraversion influences adjustment by affecting which coping strategies an individual typically uses. Several investigators have reported that high levels of extraversion are associated with increased reliance on problem-focused coping, positive reappraisal, emotional release, and support seeking (Amirkhan, Risinger, & Swickert, 1995; McCrae & Costa, 1986; Rim, 1987; Watson & Hubbard, 1996). Maltby and colleagues demonstrated that the significant relationship between extraversion and life satisfaction in their study could be explained by individual differences in coping styles (Maltby, Day, & Barber, 2004).

Research suggests that the relationship between extraversion and coping also exists among patients and caregivers who are dealing with chronic illness. Newth & Deongis (2004) demonstrated that extraversion was correlated with distancing, emotional expression, and problem solving among patients with rheumatoid arthritis. In a study of caregivers for patients with dementia, Hooker, Frazier, and Monohan (1994) reported that extraversion was associated with increased problem-focused coping and decreased emotion-focused coping. Caregivers who were high on extraversion in this investigation tended to use less emotion-focused strategies; such as, self-blame, wishful thinking, and avoidance (Hooker et al., 1994).

Few studies have examined the relationship between extraversion and coping among MS patients. In the only published investigation of this relationship in MS patients, Ratsep and colleagues (2000) reported that extraversion was highly correlated with task-oriented coping among health controls; however, extraversion was not
significantly related to any coping strategies among MS patients. Because Ratsep et al.’s (2000) study only examined three global dimensions of coping and because it has not been replicated with another sample of MS patients, it cannot be concluded that extraversion has no effect on coping. Due to the host of research suggesting that extraversion directly affects coping choice in other populations, I expected that MS patients’ level of extraversion would be directly associated with coping choice, and therefore, indirectly related to adjustment outcomes in the present study.

2.16 Extraversion & Social Support

Some researchers, who argue that social support buffers the relationship between extraversion and adjustment, consider seeking social support as a coping strategy. Increased use of the coping strategy of support seeking has been associated with high levels of extraversion in psychiatric (Lysaker, Bryson, Marks, Greig, & Bell, 2004) and non-clinical populations (Maltby et al., 2004; Watson & Hubbard, 1996). Models of coping with MS have typically considered social support as a coping resource (McReynolds, Koch, & Rumrill, 1999; Pakenham, 1999). This conceptualization of social support has also been associated with extraversion. Sorlie & Sexton (2001) found that high levels of extraversion significantly predicted increased social support among patients coping with surgery-related stress. Research with rheumatoid arthritis patients concurs that extraversion is positively related to availability of instrumental and emotional social support (Fyrand, Wichstrom, Moum, Glennas, & Kvien, 1997; Suurmeijer, Van Sonderen, Krol, Doeglas, Van Den Heuvel, & Sanderman, 2005).
Longitudinal research also supports the link between extraversion and social support by demonstrating that high levels of extraversion are correlated with the availability of emotional support six and nine years in the future (Kokkonen & Pulkkinen, 2001).

The view of social support as a coping resource supports the buffering hypothesis, which states that social support is a mediating factor between personality and adjustment. Therefore, individuals with different personalities are hypothesized to attract different amounts of support from their social environment. Proponents of this hypothesis suggest that the social environment may influence both the actual choice of coping strategy employed, as well as the skill with which the coping strategy is executed, thereby indirectly influencing adjustment (e.g., Carpenter & Scott, 1992). Empirical support exists for the buffering effect of social support on extraversion. Fyrand et al. (1997) utilized path analysis to argue that social support explained the relationship between extraversion and adjustment outcomes (e.g., anxiety and depression).

Consistent with the literature, I expected that the current investigation would lend support to this buffering hypothesis. Therefore, I anticipated that social support would mediate the relationship between extraversion and adjustment outcomes among MS patients in this study.

2.17 Extraversion & Appraisals

Many researchers agree that appraisals of stressful situations are dependent upon personality characteristics; however, most studies have focused only on the effects of neuroticism (e.g., Watson & Clark, 1984). To a lesser extent, some research on
individual differences in cognitive appraisals has explored the effects of extraversion. Some studies have associated extraversion with decreased utilization of threat appraisals and increased use of challenge appraisals (Gallagher, 1990; Hemenover & Dienstbier, 1998). Mak and colleagues (2004) supported the notion that cognitive appraisals buffer the effects of extraversion on adjustment by reporting that high levels of extraversion predicted increased use of challenge appraisals, which predicted decreased depressive symptoms in their investigation.

While some evidence exists for the buffering effect of cognitive appraisals on extraversion, many studies fail to find a significant relationship between the two (Hojat, Gonnella, Erdmann & Vogel, 2003; Meuser & Marwitt, 1999). David and Suls (1999) found that extraversion did not significantly predict appraisals of stressor controllability or severity, which parallel the notions of threat and harm appraisals in the current investigation. Due to the conflicting evidence in the literature, I hypothesized that cognitive appraisals would not yield a buffering effect between extraversion and adjustment among MS patients in the current investigation.

2.18 The Present Study

A great deal of research has explored the relationships among coping, cognitive appraisals, and social support. Researchers have proposed two primary models by which these variables are thought to affect adjustment. The direct effects model suggests that coping, cognitive appraisals, and social support influence adjustment directly (Aldwin & Revenson, 1987; Cohen & Wills, 1985). As mentioned previously, a multitude of
research has supported the individual direct effects of each of these variables on adjustment. Additionally, the utility of the direct effects model has been demonstrated with a variety of disease populations (Pakenham, Dadds, & Terry, 1994; Thompson et al., 1992). Pakenham (1999) found significant support for the direct effects model among MS patients.

In an attempt to account for variations in adjustment that could not be explained by the direct effects model, researchers proposed the stress buffering model. This model suggests that coping buffers the negative effects of cognitive appraisals on adjustment; and therefore, the negative consequences of stress appraisals are only evident at high levels of stress, because effective coping strategies reduce the negative effects of stress appraisals in most situations (Finney et al., 1984). Although little research exists examining the stress buffering model, several researchers have reported support for this model among MS patients and caregivers of patients with chronic illness (Goode, Haley, Roth, & Ford, 1998; Pakenham, 1999).

Consistent with previous research, the current investigation examined how coping strategies, cognitive appraisals, and social support affect the relationship between illness stressors and adjustment outcomes. I began by assessing the utility of the traditional direct effects model (see Figure S.1). The traditional direct effects model hypothesizes that coping strategies, cognitive appraisals, and social support have direct effects on adjustment outcomes. It was expected that increased social support, increased use of coping strategies, and increased reliance on adaptive cognitive appraisals (e.g., increased
challenge, decreased harm and threat appraisals) would have direct positive effects on
adjustment.

I also assessed the utility of the traditional stress buffering model (see Figure S.2) in
explaining adjustment to MS-related stressors. The traditional stress buffering model
purports that coping buffers the effects of cognitive appraisals on adjustment. In the
current investigation, I hypothesized that cognitive appraisals would influence adjustment
indirectly, by affecting coping efforts. Furthermore, it was expected the social support
would yield a direct positive effect on adjustment in this model. Given the strength of the
relationships between cognitive appraisals and coping, I hypothesized that the traditional
stress buffering model would yield better fit to the data in the current investigation than
the traditional direct effects model.

Due to the wealth of research supporting these models, I expected that both the
traditional direct effects model (Figure S.1) and traditional stress buffering model (Figure
S.2) would prove useful in explaining coping among MS patients. However, the present
study extended previous findings by exploring how personality variables influence these
stress and coping models. I examined the effects of personality variables on adjustment
by incorporating neuroticism and extraversion into the traditional direct effects model,
creating the personality direct effects model (see Figure S.3).

The personality direct effects model hypothesizes that coping strategies, cognitive
appraisals, social support, neuroticism, and extraversion have direct effects on adjustment
outcomes (see Figure S.3). Because the significant effects of neuroticism and
extraversion on adjustment have been replicated in many studies, it was expected that
extraversion would have direct positive effects on adjustment, and neuroticism would have direct negative effects. Furthermore, because I hypothesized that personality variables were critical to explaining individual differences in coping, it was expected that incorporation of personality variables into the traditional direct effects model would improve the utility of the model in explaining adjustment to MS-related stressors. Therefore, I anticipated that the personality direct effects model (Figure S.3) would provide a better explanation of the data than the traditional direct effects model (Figure S.1).

Although personality variables were expected to directly affect adjustment, I anticipated that personality variables would more significantly affect the stress and coping model by directly influencing cognitive appraisals, social support, and coping strategies, thereby indirectly affecting adjustment (see Figure S.4; Personality Stress Buffering Model). The personality stress buffering model hypothesizes that cognitive appraisals, social support, and coping buffer the effects of personality on adjustment. According to this model, researchers expected that extraversion and neuroticism would influence adjustment indirectly, by affecting social support and coping efforts in the current investigation. Furthermore, this model hypothesized that neuroticism would influence adjustment indirectly, by affecting cognitive appraisals, which would influence coping efforts and adjustment outcomes (see Figure S.4).

While the traditional stress buffering was expected to adequately explain the relationships between stress and coping among MS patients, I hypothesized that the incorporating personality variables into the stress buffering model would increase the
predictive and explanatory value of the model. Consequently, it was expected that the personality stress buffering model (Figure S.4) would offer a superior explanation of the data than the traditional stress buffering model (Figure S.3).
CHAPTER 3
METHOD

3.1 A Priori Power Analysis

Prior to data collection, I conducted a power analysis to determine the minimum sample size necessary to achieve acceptable power when assessing model fit. Since the hypothesis of exact fit is almost certainly incorrect, Browne and Cudeck (1993) suggest that researchers consider the more realistic hypothesis of not-close fit. Therefore, I sought to determine the minimum sample size necessary to assess the hypothesis of not-close fit ($\varepsilon > .10$) and the alternative of close fit ($\varepsilon \leq .05$) by examining the 90% confidence interval (CI) for $\varepsilon$. MacCallum, Browne, and Sugawara (1996) suggest that utilizing confidence intervals (CIs) to convey information about model fit is preferred to relying on significance tests of point estimates, because CIs communicate information about the precision of the estimate, as well as its value.

The traditional direct effects model and the traditional stress buffering model both include 12 manifest variables, 18 free parameters, and therefore, have 60 degrees of freedom each (see Figures S.5 and S.6). The personality direct effects model contains 18 manifest variables, 42 free parameters, and therefore, has 129 degrees of freedom (see
Figure S.7). The personality stress buffering model includes 18 manifest variables, 48 free parameters, and therefore, has 123 degrees of freedom (see Figure S.8). Because the traditional direct effects model has the least degrees of freedom, this model will necessitate the largest sample size in order to achieve a power of .80. Therefore, I determined the minimum sample size necessary to assess fit in the traditional direct effects model, as this number will exceed the sample size necessary to examine the other models. Methods described in MacCallum, Browne & Sugawara (1996) were utilized to determine that analyzing the traditional direct effects model necessitates a minimum of 240 participants to achieve power of .80, which was set as the desired power by convention.

3.2 Population

The National Multiple Sclerosis Society (NMSS) and the North American Research Committee on Multiple Sclerosis (NARCOMS) have compiled demographic information about the MS population. NMSS reports indicate that nearly two-thirds of MS patients are female, representing a significant gender disparity in the incidence of this disease (NMSS, August 2005). A recent NARCOMS report indicated that over 90% of their 28,000 research participants identified themselves as White/Caucasian, indicating that individuals who identify as African American, Asian, or Hispanic/Latino likely comprise a small minority of the MS population (Tyry, 2005).
Research indicates that 75-80% of MS patients are initially diagnosed with relapsing-remitting multiple sclerosis (RRMS), in which patients experience a series of relapses followed by complete or partial disappearance of symptoms (called remission). Approximately 10-20% of patients are initially diagnosed with primary progressive MS (PPMS), which involves continuous progression of disease symptoms with little or no periods of remission. Clinical statistics suggest that roughly half of patients who are initially diagnosed with RRMS will develop secondary progressive MS (SPMS) within 10 years and that 90% will develop SPMS within 25 years. Patients with SPMS stop experiencing relapses and begin a steady progression of disease symptoms. Lastly, a small percentage of patients (roughly 5%) experience progressive relapsing MS (PRMS), which involves progressive deterioration from onset, with subsequent superimposed relapses (Kalb, 2003; Reipert, 2004; Tullman et al., 2004).

3.3 Sample

Individuals who have been diagnosed with MS were invited via electronic solicitations to participate in the study. With the consent of the moderators of the various electronic outlets, researchers posted invitations to participate on various bulletin boards (e.g., National Multiple Sclerosis Society – MS World Message Boards, MSers United, MS Friends global, MS togetherness, and MSers helping MSers) and list serves (e.g., MS Information Exchange and MS LIST). The invitation announced the existence of study exploring coping with MS and invited MS patients to contact researchers for information about participation (see Appendix A).
Individuals who expressed an interest in participating were sent information about the study via electronic mail. These e-mail solicitations provided background information about the research project, information about what participation would entail, and a hyperlink to direct participants to the research project website (see Appendix B). All contact with potential participants indicated that participation in the study was voluntary and that identifying information would be kept confidential.

Participants included 329 individuals who reported that their diagnosis of MS had been confirmed via magnetic resonance imaging ($n = 306$), spinal tap ($n = 165$), evoked potentials ($n = 109$), or some combination of these assessments. Four respondents were removed from the study because their diagnosis of MS had not been confirmed by formal assessment. Demographic information for all participants is provided in Table 3.1.
<table>
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<th>Gender</th>
<th>Male: n = 63</th>
<th>Race/Ethnicity</th>
<th>Caucasian: n = 276</th>
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<td>African American: n = 31</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Hispanic/Latino: n = 10</td>
<td></td>
</tr>
<tr>
<td>Health Status</td>
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<td>Race/Ethnicity</td>
<td>Caucasian: n = 276</td>
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<td></td>
<td>Very Good: n = 64</td>
<td>African American: n = 31</td>
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<td>Education</td>
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<td></td>
<td>SPMS: n = 47</td>
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<td>Part Time: n = 26</td>
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<td></td>
<td>Disability: n = 115</td>
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<td></td>
<td>Unemployment: n = 2</td>
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<td></td>
<td></td>
<td>Other: n = 20</td>
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</tr>
</tbody>
</table>

Note. Disease course variables include: relapsing-remitting MS (RRMS), primary progressive MS (PPMS), secondary progressive MS (SPMS), and progressive relapsing MS (PRMS).

Table 3.1 Demographic information for all participants. This table includes information about gender, health status, disease course, race/ethnicity, marital status, education, and employment status for all MS patients in the current investigation.
Consistent with diagnostic statistics, the majority of the sample had been diagnosed with Relapsing-Remitting Multiple Sclerosis ($n = 250, 75\%$), while fewer participants reported diagnoses of Primary Progressive ($n = 27$), Secondary Progressive ($n = 47$), or Progressive Relapsing MS ($n = 5$) (Confavreux & Vukusic, 2006). During the course of their illness, participants had experienced an average of 7.06 exacerbations; however, this figure varied widely across participants ($SD = 11.07$). Patients were diagnosed with MS at an average age of 37.6 years ($SD = 9.4$), while participants’ average age was 43.9 years at the time of the study ($SD = 9.9$). Roughly one third of participants described their current health status as failed ($n = 105$), while another third described their current health as good ($n = 103$). The remaining third of participants reported that their current health was very poor ($n = 1$), poor ($n = 28$), very good ($n = 64$), or excellent ($n = 21$).

Consistent with the literature regarding the MS population, significantly more females ($n = 266$) than males ($n = 63$) participated in the study (Minden, Frankel, Hadden, Perloff, Srinath, & Hoaglin, 2006; NMSS, August 2005). In addition, the majority of participants identified themselves as Caucasian/European ($n = 276$), with only a minority of participants identifying as Asian/Pacific Islander ($n = 8$), African American/Black ($n = 31$), Hispanic/Latino ($n = 10$). The composition of the sample with respect to race/ethnicity is consistent with demographics reported by the North American Research Committee on Multiple Sclerosis (NARCOMS; Tyry, 2005).

Multiple sclerosis patients from all areas of the United States participated ($n$’s ranged from 30 to 70 for each region). Additionally, 12% of participants reported
residing outside the United States \( (n = 40) \). Sixty-three percent of the sample indicated that they were currently married \( (n = 208) \). Fifty-two percent of the sample had completed a post-secondary degree \( (n = 171) \). Forty-five percent of participants reported being employed at least part-time \( (n = 148) \), while 35% reported receiving disability benefits \( (n = 115) \). The composition of the current sample, with respect to employment and disability, is consistent with participants in the NARCOMS registry (North American Research Committee on Multiple Sclerosis, 2000).

Sixty percent of MS patients in the sample reported that they have never seen a psychologist, clergyman, or counselor to aid in dealing with the emotional stress of the diagnosis \( (n = 198) \). Twenty-four percent of participants indicated that they had sought some form of counseling in the past \( (n = 52) \), while the remaining 15.8% reported that they currently see a psychologist, clergyman, or counselor to discuss MS-related stress \( (n = 79) \). Overall, the current study achieved a sample which was representative of the MS population with respect to gender, race, disease course, and employment status. Although MS patients in the current sample reported lower than average levels of depression, outcome measures indicated that the sample was representative of the MS population with respect to most outcome measures.

**3.4 Procedures**

Solicitation e-mails included a hyperlink directing potential participants to the introductory webpage, which provided background information about the research project and details about what participation would entail (see Appendix C). Investigators
obtained a waiver of written consent from The Ohio State University Institutional Review Board. Prior to participation, respondents acknowledged that they had read the statement regarding the nature of the study and that they understood their right to withdraw from the study at any time. In addition, participants certified that they were at least 18 years of age (see Appendix D).

Each participant completed a series of web-based instruments; including, a demographic questionnaire, Self Administered Expanded Disability Status Scale (EDSS-S; Bowen, Gibbons, Gianas, & Kraft, 2001), Coping with Multiple Sclerosis Scale (CMSS; Pakenham, 2001), Big Five Inventory (BFI; John, Donahue, & Kentle, 1991), Cognitive Appraisal of Health Scale (CAHS; Ahmad, 2005), Social Support Questionnaire (Zich & Temoshok; 1987), Satisfaction with Life Scale (SWLS; Deiner, Emmons, Larsen, & Griffin, 1985), Center for Epidemiologic Studies – Depression Scale (CES-D; Radloff, 1977), Beck Anxiety Inventory for Primary Care (BAI-PC: Beck, Steer, Ball, Ciervo, & Kabat, 1997), and Mental Health Inventory (MHI; Fischer, LaRocca, Miller, Ritvo, Andrews, & Paty, 1999). After participants completed the measures, their web browsers were automatically directed to a page describing the purpose of the research and providing contact information for future inquiries (see Appendix E).
3.5 Instruments

3.5.1 Demographic Questionnaire.

This instrument gathered information about age, gender, race/ethnicity, education, socio-economic status (SES), region of residence, marital status, employment status, and subjective health rating. The demographic questionnaire also contained several questions pertaining to MS disease course (e.g., relapsing-remitting or progressive), duration of the disease, and experience of exacerbations (see Appendix F).

3.5.2 Self Administered Expanded Disability Status Scale (EDSS-S; Bowen et al., 2001).

The Expanded Disability Status Scale, a widely used indicator of MS disease severity, assesses a patient’s disease progression and degree of neurological impairment (Chwastiak, Ehde, Gibbons, Sullivan, Bowen, & Kraft, 2004). The self-report version of the EDSS has proven to be highly correlated with the physician-administered scale (Bowen et al., 2001). The EDSS-S assesses functioning in each of eight designated systems: pyramidal, cerebellar, brainstem, cerebral, bowel and bladder, sensory, visual, and other. Functioning within each system is rated between 0 and 6, depending on severity. Participants scoring 4 or above in brainstem, cerebral, or visual functioning were excluded from the current study because such scores indicate severe disability in these areas (Kurtzke, 1983; Bowen et al., 2001). Eleven participants were excluded from the study for this reason. Scores on pyramidal (strength), cerebellar (coordination), bowel and bladder, and sensory functioning were not considered grounds for exclusion,
because these problems should not interfere with a participants’ ability to complete the instruments in this study (see Appendix G).

The EDSS-S has demonstrated acceptable reliability in assessing disability in MS patients. Similar to other self-administered measures of disability ($\alpha = .84$ for the minimal record of disability; Solari, Amato, Bergamaschi, Logroscino, Citterio, Bochicchio, & Filippini, 1993), researchers have reported acceptable intraclass correlation coefficients for administrations of the EDSS-S to MS patients ($\alpha = .89$; Bowen et al., 2001). Because only three ESDD-S items were assessed in the current investigation, the intraclass correlation coefficient was markedly lower in the current sample ($\alpha = .64$). While this low intraclass reliability casts doubt upon the reliability of the EDSS-S in providing an overall assessment of disability, this does not discount the utility of individual items to eliminate severely cognitively disabled participants from the sample.

The validity of the EDSS has been supported by research illustrating that the patient-administered EDSS-S yields comparable scores to the physician administered EDSS. Researchers have reported 84% agreement (within one point) between patient and physician-administered scales (Bowen et al., 2001). In the current study, the validity of the EDSS-S with MS patients was supported by the negative correlation with subjective health status ($r = -.49$). Individuals who endorsed more disability items on the EDSS endorsed worse subjective health status, indicating that the objective physical health questions on the EDSS were consistent with patients' subjective experience of their health.
3.5.3 Coping with Multiple Sclerosis Scale (CMSS; Pakenham, 2001).

The CMSS was developed by Pakenham (2001) to assess coping strategies used to deal with multiple sclerosis, which have not been captured by previously developed coping scales. Although previous MS researchers have relied on coping scales developed for the general population, general coping scales do not include the diversity of strategies used to cope with multiple sclerosis (Maes et al., 1996; Pakenham, 2001). Therefore, the current study utilized the CMSS, which includes specific strategies for coping with multiple sclerosis.

The CMSS is a 29-item self-report questionnaire that assesses reactions to a specific stressful situation. Participants were asked to describe the main MS-related problem they have experienced in the last month and to rate how stressful this problem has been in the past month on a 7-point Likert scale (from 1 = not stressful at all to 7 = extremely stressful). Participants were then asked to indicate how often they have tried each of 29 coping strategies in dealing with this problem in the past month. Responses were recorded on a 5-point Likert scale (from 1 = never to 5 = very often) (see Appendix H).

During construction of the CMSS, Pakenham (2001) concluded that the main MS-related problem reported by respondents could be categorized into four groups. MS patients in Pakenham’s (2001) study reported physical (78% of respondents), emotional (44%), instrumental (39%), and relationship (22%) difficulties. Note that most participants reported multiple problems ($M = 1.83$, $SD = 1.13$). Respondents in the current study indicated higher incidence of instrumental problems and lower incidence of
physical problems, emotional, and relationship problems than MS patients in Pakenham’s (2001) study. The present investigation found that 72% of respondents reported physical problems (e.g., fatigue, sensory, bladder, and bowel symptoms), 29% reported emotional problems (e.g., depression, anger, frustration), 48% reported instrumental problems (difficulty with daily living activities, employment, access) and 12% reported relationship problems (difficulties with family members, partner, and friends). Most participants in the current study indicated more than one main MS-related problem ($M = 1.61, SD = .79$). When asked to rate how stressful their main MS-related problem had been in the past month, participants indicated that it was slightly more than somewhat stressful ($M = 5.11, SD = 1.75$).

Pakenham’s (2001) factor analysis of the CMSS indicated the presence of seven subscales; including, problem solving, physical assistance, acceptance, avoidance, personal health control, energy conservation, and emotional release. In the original sample, alpha reliabilities ranged from .56 to .74 for individual subscales. The current sample yielded comparable alpha reliabilities, ranging from .53 to .70 for individual subscales ($\alpha = .70$ for problem solving, $\alpha = .67$ for physical assistance, $\alpha = .53$ for emotional release, $\alpha = .54$ for avoidance, $\alpha = .56$ for personal health control, $\alpha = .60$ for acceptance, and $\alpha = .68$ for energy conservation). Although these reliabilities are low in comparison to established coping scales, results from Pakenham’s (2001) study indicate that the CMSS is particularly valid for multiple sclerosis patients. Pakenham’s (2001) participants rated the CMSS as extremely relevant to coping with MS ($M = 6.3$ out of 7) and indicated that no coping strategies should be added to the scale.
In order to establish convergent validity, Pakenham compared the CMSS with the Ways of Coping Checklist (WCC; Vitaliano et al., 1985), an established coping questionnaire. Every CMSS subscale, with the exception of physical assistance, significantly correlated with two different subscales of the WCC. However, these correlations did not coincide with the problem-focused and emotion-focused distinctions used by the WCC. For example, the acceptance subscale of the CMSS positively correlated with wishful thinking (an emotion-focused WCC subscale) and problem solving (a problem-focused WCC subscale). Pakenham (2001) suggests that these contradictions indicate that the CMSS captures nuances within coping with MS that have been overlooked by previous measures. For this reason, the present study considered each subscale of the CMSS separately, instead of grouping subscales into broad categories (e.g., problem-focused and emotion-focused coping).

3.5.4 Big Five Inventory (BFI; John, Donahue, & Kentle, 1991).

The BFI is an adjective rating measure that reflects the work of Goldberg and colleagues (see Goldberg, 1993). The items were developed from English trait adjectives that have been shown to be ideal indicators of the five factor model of personality (John, 1990). This instrument yields scores on each of the Big Five personality traits; including, neuroticism, extraversion, openness, conscientiousness, and agreeableness. All five subscales have demonstrated acceptable internal consistency reliability in previous studies (α’s ranging from .75 to .90, averaging above .80) (John & Donahue, 1998; John et al., 1991).
Similar to the majority of studies examining the influence of personality in response to stress among chronic illness patients, the present investigation purports hypotheses about only neuroticism and extraversion (Matthews, Deary, & Whiteman, 2003). In order to maintain a manageable number of items in the battery, participants completed only the sixteen BFI items which assess neuroticism and extraversion. BFI items assessing openness, agreeableness, and conscientiousness were not administered. Respondents were asked to use a 5-point Likert scale (from 1 = strongly disagree to 5 = strongly agree) to rate themselves on each of 16 descriptive phrases (see Appendix I).

The extraversion subscale assesses gregariousness, warmth, assertiveness, and positive emotions. The neuroticism subscale measures anxiety, instability, and impulsiveness. Administration of the BFI to MS patients in the current study yielded alpha reliabilities ($\alpha = .84$ for extraversion and $.86$ for neuroticism) and mean scores ($M = 3.25$ for extraversion and $3.09$ for neuroticism) which are comparable to administrations with diverse samples (Benet-Martinez & John, 1998; John et. al, 1991).

John and Donahue (1998) demonstrated that intercorrelations between subscales are generally low ($r$’s ranging from $.20$-.30), indicating that the subscales of the BFI represent independent constructs. The construct validity of the inventory is supported by findings that the BFI exhibits a convergent correlational pattern with other measures of the big five personality factors, such as the NEO Personality Inventory and Goldberg’s Big Five Factor Markers (mean $r$’s = .75 and .80, respectively) (Costa & McCrae, 1992; Goldberg, 1992; John & Donahue, 1998).
3.5.5 Cognitive Appraisal of Health Scale, (CAHS; Ahmad, 2005).

The CAHS was originally developed by Kessler (1998) as a 28-item assessment of an individual’s cognitive appraisal of his or her health status. The scale was designed to assess dimensions of threat, challenge, harm/loss, and benign/irrelevant appraisals. The scale was originally administered to female breast cancer patients, ranging in age from 29 to 82. Participants’ time since diagnosis ranged from 0.3 to 21 years (Kessler, 1998). The variety of patients in the original sample indicates that the CAHS is applicable to a wide range of patients.

Because the construction of the CAHS relied solely on exploratory factor analysis, subsequent authors have utilized confirmatory factor analysis to examine the factor structure of the scale and to identify critical items. Ahmad (2005) conducted confirmatory factor analysis on CAHS data from prostate cancer patients. Since many items which loaded onto the benign/irrelevant factor also loaded highly onto other factors, researchers removed this factor. Ahmad (2005) conducted a series of confirmatory factor analyses and selected a 13-item version of the CAHS because it yielded acceptable fit indices (e.g., RMSEA). Results supported the construct validity of the three factor model, as evidenced by factor loadings ranging from .46 to .77 (Ahmad 2005). Because a cognitive appraisal scale designed specifically for MS patients was not available, the present study utilized Ahmad’s (2005) version of the CAHS which has proven both reliable and valid for use with chronic illness populations.

Ahmad’s (2005) version of the CAHS consists of 13 statements concerning the patient’s feelings toward his or her health problems. The scale asks participants to rate
their level of agreement with each item on a 5-point Likert scale (from 1 = strongly disagree to 5 = strongly agree) (see Appendix J). In the current study, participants were instructed to respond to each item with respect to the MS-related problem they described on the previous page (in response to the Coping with Multiple Sclerosis Scale; Pakenham, 2001).

Ahmad’s (2005) version of the CAHS contains three factors. The harm/loss factor describes the damage that respondents perceive has already occurred. The threat factor describes the harm anticipated by respondents that has not yet occurred. The challenge factor describes judgments by respondents that they can meet or overcome the demands of the stressful situation. In the original sample, Cronbach’s alpha coefficients were .79 for the harm/loss factor, .74 for the threat factor, and .70 for the challenge factor (Ahmad, 2005). Data from MS patients in the present investigation yielded comparable Cronbach’s alpha coefficients (α = .81 for the harm/loss factor, α = .78 for the threat factor, and α = .73 for the challenge factor). Correlations between factors ranged from .47 to .59, indicating that the subscales of the CAHS represent distinct, yet related, constructs.

3.5.6 Social Support Questionnaire (Zich & Temoshok, 1987).

This social support questionnaire was originally developed to assess various aspects of the social support structure available to HIV/AIDS patients. Because a standardized scale specific to MS was not available, Zich and Temoshok’s (1987) social support questionnaire was administered to MS patients in the current study. It can be
argued that items on this social support questionnaire are appropriate for the MS population, because both MS and HIV/AIDS are chronic illnesses with uncertain prognoses and fluctuating symptoms. Consequently, it can be expected MS and HIV/AIDS patients utilize social support to cope with comparable illness-specific difficulties.

Zich and Temoshok’s (1987) 8-item social support questionnaire assesses perceived support in the form of emotionally sustaining behaviors (e.g., someone to talk to), problem-solving behaviors (e.g., someone who offers suggestions), indirect personal influence (e.g., someone who conveys a willingness to help), and physical support (e.g., someone to whom you can turn when you need to borrow something). Respondents were asked to use a 5-point Likert scale to indicate how desirable the support is, how available it is, how often it is used, and how useful it is. These questions were designed to assess the desirability, availability, frequency, and usefulness of social support received by the respondent (see Appendix O).

Desirability, availability, frequency, and usefulness comprise the four subscales of the social support questionnaire (Zich & Temoshok, 1987). All four subscales demonstrated acceptable internal consistency reliability among HIV/AIDS patients in the validation sample ($\alpha$’s ranging from .84 to .89; Zich & Temoshok, 1987) and in subsequent research ($\alpha$’s ranging from .88 to .90; Pakenham & Rinaldis, 2001). In the current study, internal consistency reliability coefficient alphas equaled .78 for desirability, .88 for availability, .87 for frequency, and .78 for usefulness.
Pakenham & Rinaldis (2001) found that the mean subscale score among HIV/AIDS patients in their sample was 23.29 ($SD = 8.39$) for availability, 23.85 ($SD = 6.86$) for frequency, and 33.17 ($SD = 5.48$) for usefulness. On the three subscales assessed in both populations, MS patients in the present investigation scored higher than HIV/AIDS patients in Pakenham & Rinaldis’s (2001) sample ($M = 26.77$ and $SD = 6.59$ for availability, $M = 25.76$ and $SD = 6.42$ for frequency, and $M = 33.68$ and $SD = 4.69$ for usefulness). This discrepancy can be expected, given the lack of social support that HIV/AIDS patients report receiving as a result of their disease (Arend, 2005; Shippy & Karpiak, 2005). Zich & Temoshok (1990) reported that AIDS patients in their sample scored an average of 35.42 ($SD = 3.65$) on the desirability subscale, which is comparable to the average score of MS patients in the current study ($M = 33.98$, $SD = 4.77$).

3.5.7 The Satisfaction with Life Scale (SWLS; Deiner et. al, 1985).

Participants completed the SWLS to assess subjective well-being. The SWLS consists of five global statements about life satisfaction. Participants were asked to indicate their level of agreement with each statement on a 7-point Likert scale (from 1 = *strongly disagree* to 7 = *strongly agree*). Possible scores ranged from minimal satisfaction with life (5) to very high satisfaction with life (35) (see Appendix K). While the SWLS was originally created for healthy university students, subsequent research has illustrated that this measure is appropriate for multiple sclerosis patients (Pakenham, 2005). The mean SWLS score among MS patients in Pakenham’s (2005) samples was
20.91 (SD = 7.76). Administration of the SWLS in the present investigation yielded comparable results (M = 19.21, SD = 7.88).

Diener et. al’s (1985) administration of the SWLS demonstrated convergence with several other measures of well being; including, the Gurin Scale (r = .62; Gurin, Veroff, & Feld, 1960) and the Delighted-Terrible Scale (r = .68; Andrews & Withey, 1976; Deiner et. al, 1985). The SWLS has demonstrated strong internal consistency reliability and acceptable temporal stability across samples. The original validation sample yielded a coefficient alpha of .87 and a 2-month test-retest reliability coefficient of .82 (Pavot, Diener, Colvin, & Sandvik, 1991). Previous administration of the SWLS to MS patients produced a Cronbach’s alpha coefficient of .91 (N = 381; Pakenham, 2005). Data from the current investigation yielded Cronbach’s alpha coefficient of .89 among MS patients (N = 329).

3.5.8 Center for Epidemiologic Studies – Depression Scale (CES-D; Radloff, 1977).

The CES-D is a 20-item measure designed to assess depressed mood and symptomatology in the general population. The instrument was created to assess six components of depression; including, depressed mood, feelings of worthlessness, feelings of hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance (Radloff, 1977). This instrument is widely used in chronically ill populations because it does not over-emphasize physical symptoms of depression. Because physical manifestations of depression, such as fatigue, overlap with many symptoms of multiple sclerosis; utilizing a scale that does not emphasize somatic symptoms is particularly
important with this population (Hann, Winter, & Jacobsen, 1999). In the current investigation, participants were asked to indicate how often they have felt a certain way during the last week (e.g., depressed, happy, lonely). Participants responded to each item on a 4-point Likert scale (from 0 = rarely or none of the time, less than 1 day to 3 = most or all of the time, 5-7 days) (see Appendix L).

In a sample of patients with predominantly relapsing-remitting MS, researchers found a mean CES-D score of 32.6 (95% CI = 30.1 to 35.1; Pandya, Metz, & Patten, 2005). Researchers obtained significantly lower levels of depression among MS patients (M = 23.68, 95% CI = 22.33 to 25.03) in the current investigation. However, the mean CES-D score for MS patients in the current sample significantly exceeded the cutoff score for clinically significant depression (Scores of 15 or higher indicate clinically significant depression: Radloff, 1977).

The CES-D has demonstrated acceptable internal consistency in the general population (α = .85) and psychiatric populations (α = .90) (Radloff, 1977). The instrument also yield acceptable internal consistency reliability among MS patients (α = .90) (Verdier-Taillefer, Gourlet, Fuhrer, & Alperovitch, 2001). Administration of the CES-D to MS patients in the current study supported previous findings that this instrument is sufficiently reliable with the multiple sclerosis population (α = .92). Initial validation of the CES-D yielded a correlation coefficient of .85 with the Beck Depression Inventory (Radloff, 1977). Recent administrations of the CES-D to MS patients demonstrated that the instrument accurately detects depressive disorders in the majority
of MS patients (74.5% of the sample; Pandya et al., 2005). These findings confirm the appropriateness of using the CES-D with MS patients in the current study.

3.5.9 Beck Anxiety Inventory for Primary Care (BAI-PC; Beck et al., 1997).

The BAI-PC is a 7-item self-report measure, consisting of a subset of items from the Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). Beck et. al (1988) constructed the BAI to assess symptoms of anxiety that are independent of depression. Beck et al. (1997) chose 7 items from the BAI because they had been shown to reflect the subjective dimensions of self-reported anxiety in primary care patients.

In the current study, participants were asked to report how much they have been bothered by each symptom during the last month. Respondents rated each item according to a 4-point Likert scale (from 1 = Not at all to 4 = Severely – it bothered me a lot; see Appendix M). Each participant’s total score was calculated by summing the ratings on the 7 items, with high scores indicating high levels of anxiety. Administration of the BAI-PC to the current sample yielded a mean of 13.60 (SD = 5.024), which is significantly higher than scores in samples of primary care patients (Beck et al., 1997; Mori, Lambert, Niles, Orlander, Grace, & LoCastro, 2003).

Validation of the BAI-PC demonstrated that the instrument is unidimensional, yielding item-total correlations of .59, .77, .67, .80, .80, .61, and .81 for items 1 through 7, respectively (Beck et. al, 1997). The present investigation found comparable item-total correlations (r = .58, .78, .82, .71, .67, .52, and .78 for items 1 through 7, respectively). The BAI-PC has demonstrated acceptable internal consistency among primary care
patients, with Cronbach’s alphas ranging from .88 to .90 (Beck et. al, 1997; Mori, Lambert, Niles, Orlander, Grace, & LoCastro, 2003). In the current study, the BAI-PC demonstrated comparable internal consistency reliability (\(\alpha = .89\)). Significant correlations with DSM-IV diagnosis of anxiety disorders lend support to the validity of the BAI-PC \((r = .67;\) Beck et. al, 1997). Validity has been confirmed by demonstrations of significant correlations with the original BAI among primary care patients \((r = .73;\) Mori et al., 2003).

3.5.10 Mental Health Inventory (MHI). A subscale of the Multiple Sclerosis Quality of Life Inventory (MSQLI: Fischer, LaRocca, Miller, Ritvo, Andrews, & Paty, 1999).

The Mental Health Inventory (MHI) is an 18-item subscale of the Multiple Sclerosis Quality of Life Inventory (MSQLI), which is a comprehensive outcome assessment battery developed by researchers associated with the Consortium of Multiple Sclerosis Centers (Fischer et. al, 1999). The Mental Health Inventory (MHI) was originally developed during the National Health Insurance Study (Veit & Ware, 1983), and a revised version was included in the MSQLI based on its reliability and validity with MS patients (Ritvo, Fischer, Miller, Andrews, Paty, & LaRocca, 1997). Because the MSQLI does not calculate an overall quality of life index, and instead provides an independent score for each subscale, the authors encourage the use of individual subscales for research purposes (Ritvo et. al, 1997). The MHI consist of eighteen items, describing different emotional states. Participants were asked to rate how much of the
time during the past 4 weeks they have felt each emotion on a 6-point Likert scale (from 1 = *all of the time* to 6 = *none of the time*; see Appendix N).

Ritvo et. al’s (1997) administration of the MHI to MS outpatients resulted in a mean item score of 4.23, which is one full standard deviation below the mean for the normative population. The current investigation yielded comparable scores, with MS patients averaging an item score of 4.15 ($SD = 0.96$). The MHI consists of 4 subscales; including, anxiety, depression, behavioral control, and positive affect. The instrument also yields a total mental health score. In the validation sample of 300 patients receiving care at major MS comprehensive care centers, the 18-item MHI demonstrated acceptable internal consistency reliability ($\alpha = .93$). Cronbach’s alpha reliabilities for the subscales ranged from .78 to .87 (Ritvo et. al, 1997). Recent administrations have revealed acceptable internal consistency in younger (< 60, $r = .85$) and older MS patients (> 60, $r = .91$) (DiLorenzo, Halper, & Picone, 2003). Results from the current study reveal alpha reliabilities of .85, .91, .80, and .87 for the subscales of anxiety, depression, behavioral control, and positive affect, respectively. The 18-item MHI also demonstrated acceptable internal consistency reliability ($\alpha = .94$).

Previous research has supported the construct validity of the MHI by demonstrating negative correlations with various measures of adjustment; including, the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and Profile of Mood States-Short Version total distress scale (POMS-SV: Shacham, 1983) ($r$’s ranging from -.34 to -.70, DiLorenzo et al., 2003). These findings suggest that the MHI is measuring a distinct component of adjustment among MS patients.

63
3.6 Data Analysis

Cronbach’s alpha coefficients were calculated to assess the reliability of each unidimensional measure, and separate Cronbach’s alpha coefficients were calculated for each factor of multidimensional measures. MANCOVAs were utilized to examine group differences across gender, marital/partner status, disease course, and counseling seeking for each dependent measure. Due to the uneven distribution of race/ethnicity in our sample, differences across race/ethnicity could not adequately be examined. Pearson’s product-moment correlation coefficients were calculated to examine the interrelationships among the measures included. Hierarchical regression analyses were performed on each adjustment outcome to determine whether the incorporation of personality variables into regression models added predictive value.

3.6.1 Factor Analysis of the Coping with Multiple Sclerosis Scale (Pakenham, 2001).

Because the reliability and underlying structure of the CMSS have not been independently examined, the present study utilized exploratory factor analysis with target rotation to determine the factor structure of the scale and confirm that items are being considered within the appropriate subscales. A matrix of correlations between CMSS items was computed. An exploratory factor analysis was conducted on the resulting correlation matrix using CEFA software (Comprehensive Exploratory Factor Analysis, Version 2.00; Browne, Cudeck, Tateneni, & Mels, 2004). Parameters were estimated using the maximum likelihood (ML) criterion, as this method provides appropriate fit indices and parameter estimates. This yielded an unrotated matrix of estimated factor loadings.
An oblique target rotation was conducted on the resulting factor loading matrix. A target matrix was specified, containing the pattern of expected loadings based on prior research. Items in the target matrix included zeros where small loadings were expected and unspecified free entries where large loadings were anticipated. The target matrix consisted of seven columns, specifying seven factors (one for each coping subscale). In the target matrix, each item was specified to load on only one of the seven first-order factors. The root mean square error of approximation \((RMSEA)\) was examined to assess the fit of the factor analysis model, and parameter estimates were examined to confirm the factor structure of the CMSS.

3.6.2 Factor Analysis of the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991).

Since the current investigation included only one measure of neuroticism and extraversion (BFI; John et. al, 1991), these constructs could be included in the models as manifest variables. However, since manifest variables are assumed to be measured without error and since this assumption is not warranted in the present investigation, I sought to define neuroticism and extraversion as latent variables. Including manifest variables as indicators of latent variables ensures that estimates of unique variance are incorporated into the model (Kline, 1998).

In order to incorporate neuroticism and extraversion as latent variables in the hypothesized models, I sought to identify appropriate indicators for these constructs. I utilized exploratory factor analysis to partition the eight neuroticism BFI items and eight extraversion BFI items into parcels. Previous research suggests that partially aggregated
parcels (comprised of several BFI items) would serve as more reliable indicators of neuroticism and extraversion than individual items (Kishton & Widaman, 1994). It can be expected that reducing the number of manifest variables will reduce the influence of item-level non-normality (Bandalos, 2002), as well as reducing the number of sources of sampling error (MacCallum, Widaman, Zhang, & Hong, 1999).

In order to determine appropriate parcels, a matrix of correlations between the eight neuroticism BFI items was computed. Exploratory factor analysis was conducted on the resulting correlation matrix using CEFA software (Comprehensive Exploratory Factor Analysis, Version 2.00; Browne et. al, 2004). Three runs were conducted which extracted two, three, and four factors respectively. This analysis yielded an unrotated matrix of estimated factor loadings for each run. Parameters were estimated using the maximum likelihood (ML) criterion. Oblique rotation was conducted on each of the resulting factor loading matrices, utilizing the CF-Parsimax criterion. Discrepancy function values, root mean square error of approximation (RMSEA) values, and rotated factor matrices were examined to determine an interpretable number of factors to extract.

Homogeneous parcels were constructed for neuroticism, such that each parcel consisted of items which loaded highly onto one first-order factor. The resulting parcels each represented first-order factors, which in turn loaded onto the second-order factor termed neuroticism.

A similar exploratory factor analysis was conducted on the matrix of correlations between the eight extraversion BFI items to determine how the eight items would be partitioned into several manifest variables. Items which loaded onto each first-order
factor were combined to form homogeneous parcels. Each parcel represented a first-order factor, which in turn loaded onto the second-order factor termed extraversion.

3.6.3 Unrestricted Factor Analysis of Manifest Variables.

In order to specify the measurement portion of the hypothesized models, I conducted an exploratory factor analysis (EFA) with target rotation to determine which manifest variables loaded highly onto each hypothesized latent variable. A matrix of correlations between each manifest variable was constructed. An exploratory factor analysis was conducted on the resulting correlation matrix using CEFA software (Comprehensive Exploratory Factor Analysis, Version 2.00; Browne et al., 2004). Parameters were estimated using the maximum likelihood (ML) criterion. This yielded an unrotated matrix of estimated factor loadings.

An oblique target rotation was conducted on the resulting factor loading matrix. A target matrix was specified, containing the pattern of expected loadings. Each subscale of the Coping with Multiple Sclerosis Scale (CMSS: Pakenham, 2001) was expected to load highly onto the latent variable of coping. The three parcels constructed from BFI neuroticism items were expected to load highly onto the latent variable of neuroticism, while the three parcels constructed from BFI extraversion items were expected to load highly onto the latent variable, extraversion (BFI; John et al., 1991). Each subscale of the Cognitive Appraisal of Health Scale (CAHS; Ahmad, 2005) was expected to load highly onto the latent variable of cognitive appraisal. The four subscales of the Social Support Questionnaire (Zich & Temoshok; 1987) were expected to load highly onto the latent
variable of social support. The total scores for the Satisfaction with Life Scale (SWLS; Deiner et al., 1985), Center for Epidemiologic Studies – Depression Scale (CES-D; Radloff, 1977), Beck Anxiety Inventory for Primary Care (BAI-PC: Beck et al., 1997), and Mental Health Inventory (MHI; Fischer et al., 1999) were each expected to load highly onto the latent variable of adjustment.

Items in the target matrix included unspecified free entries where large loadings were expected and zeros where small loadings were anticipated. The target matrix consisted of six columns (one for each latent variable or factor) and 24 rows (one for each subscale or measure). In the target matrix, each subscale or measure was specified to load on only one of the six first-order factors. Parameter estimates were examined to confirm which manifest variables served as appropriate indicators of latent variables in the measurement models.

3.6.4 Structural Equation Modeling.

The appropriateness of the proposed models was assessed via structural equation modeling (SEM) procedures, utilizing RAMONA software in SYSTAT (Version 11.0; Browne & Mels, 1998). During initial iterations, parameters were estimated using the ordinary least squares (OLS) criterion because it is more robust than other methods to violations of distributional assumptions. Subsequent iterations utilized maximum likelihood (ML) estimation, as this is the standard method for parameter estimation and provides appropriate fit indices and parameter estimates. Utilizing SEM allowed me to assess whether the fit of the traditional direct effects model (Figure S.1) and the
traditional stress buffering model (Figure S.2) is improved by incorporating personality variables (see Figure S.3 and Figure S.4). In order to analyze the suitability of the hypothesized models via SEM, corresponding statistical models were specified for each.

The measurement model for the traditional direct effects model (Figure S.1) is illustrated in Figure S.5, and the measurement model for the traditional stress buffering model (Figure S.2) is illustrated in Figure S.6. Both of these statistical models contain 4 latent variables, 12 manifest variables, and 13 error terms. Parameter estimates for linear relationships between error terms and manifest variables were fixed at one. The variance of each latent variable was also fixed at one. SEM procedures were used to determine parameter estimates for 3 linear relationships between latent variables, 12 linear relationships between latent variables and manifest variables, and 13 variance terms for each of the models.

Figure S.7 depicts the measurement model for the personality direct effects model (see Figure S.3). This statistical model contains 6 latent variables, 18 manifest variables, and 19 error terms. Parameter estimates for linear relationships between error terms and manifest variables, as well as the variances of each latent variable, were fixed at one. SEM procedures were employed to determine parameter estimates for 5 linear relationships between latent variables, 18 linear relationships between latent variables and manifest variables, and 19 variance terms.

The measurement model for the personality stress buffering model (Figure S.4) is illustrated in Figure S.8. This statistical representation of the model contains 6 latent variables, 18 manifest variables, and 21 error terms. Parameter estimates for linear relationships...
relationships between error terms and manifest variables were fixed at one. The variance of each latent variable was also fixed at one. SEM procedures were used to determine parameter estimates for 8 linear relationships between latent variables, 18 linear relationships between latent variables and manifest variables, and 21 variance terms.

Because population discrepancy function values ($F_0$) generally decrease as the number of parameters in the model increases, utilizing $F_0$ as a measure of fit may have biased the current analysis to favor complex models. Consequently, the present study examined the Root Mean Square Error of Approximation (RMSEA) to assess model fit. RMSEA was proposed by Steiger and Lind (1980) as a measure of discrepancy per degree of freedom. This measure assesses model fit while accounting for the parsimony of the model by imposing a penalty for adding model complexity without substantially improving $F_0$. In addition, the values and confidence intervals of the parameter estimates were examined to identify meaningful relationships among variables in each stress and coping model.

3.7 Hypotheses

I anticipated that the traditional direct effects model (Figure S.5) and the traditional stress buffering model (Figure S.6) would adequately fit the data. However, because I hypothesized that personality variables are critical to explaining individual differences in coping, it was expected that the personality direct effects model (Figure S.7) and the personality stress buffering model (Figure S.8) would improve the utility of the model in explaining adjustment to MS-related stressors. Therefore, I anticipated that
the personality direct effects model (Figure S.7) would yield better fit indices than the traditional direct effects model (Figure S.5), and the personality stress buffering model (Figure S.8) would yield better fit indices than the traditional stress buffering model (Figure S.6).

Additionally, although personality variables were expected to directly affect adjustment, I anticipated that personality variables would more significantly affect the stress and coping model by directly influencing cognitive appraisals, social support, and coping strategies, thereby indirectly affecting adjustment. It was expected that the personality stress buffering model (Figure S.8) would yield the best fit to the data. Consequently, I expected that cognitive appraisals, social support, and coping would buffer the effects of personality on adjustment. In the current investigation, it was expected that extraversion and neuroticism would influence adjustment indirectly, by affecting social support and coping efforts. Furthermore, the personality stress buffering model hypothesized that neuroticism would influence adjustment indirectly, by affecting cognitive appraisals, which influence coping efforts and adjustment outcomes (see Figure S.4).
CHAPTER 4

RESULTS

4.1 Group Differences

A multivariate analysis of covariance (MANCOVA) was performed to determine whether significant group differences exist in coping strategies, cognitive appraisals, extraversion, neuroticism, social support, life satisfaction, depression, anxiety, or mental health, as assessed by the measures in the current study. Dependent variables included each subscale of the Coping with Multiple Sclerosis Scale (CMSS; Pakenham, 2001), Cognitive Appraisal of Health Scale (CAHS; Ahmad, 2005), Big Five Inventory (BFI; John et. al, 1991), and Social Support Questionnaire (Zich & Temoshok, 1987). Each measure of adjustment was also included as a dependent variable (SWLS, Diener et. al, 1985; CES-D, Radloff, 1977; BAI-PC, Beck et. al, 1997; MHI, Fischer et. al, 1999).

Four independent variables, containing two levels each, were considered in the analysis. These included gender (male and female), partner status (currently living with spouse/partner and not currently living with spouse/partner), disease course (relapsing or progressive), and counseling seeking (sought counseling and never sought counseling). Although researchers initially utilized more than two levels to measure partner status,
disease course, and counseling seeking, similar categories were collapsed to more closely balance sample size across groups. Therefore, respondents who reported being single \( (n = 59) \), divorced/separated \( (n = 52) \), or widowed \( (n = 10) \) were combined to form the group of individuals who were not currently partnered \( (n = 121) \). This group was compared with the majority of respondents who indicated that they were currently living with a spouse or partner \( (n = 208) \). Similarly, respondents with primary progressive \( (n = 27) \), secondary progressive \( (n = 47) \), and progressive relapsing \( (n = 5) \) disease course were considered together, forming a category of individuals who have a progressive disease course \( (n = 79) \). These respondents were compared with the majority of the sample, who indicated experiencing a relapsing-remitting disease course \( (n = 250) \).

Furthermore, individuals who sought counseling in the past \( (n = 52) \) and those who were currently receiving counseling \( (n = 79) \) were considered together, as individuals who sought counseling at some time \( (n = 131) \). This group was compared to the majority of respondents who indicated that they had never sought counseling \( (n = 198) \).

Since it was anticipated that participant’s health status would likely affect the dependent variables, as well as levels of several independent variables (e.g., whether the patient was partnered or whether the patient sought counseling), subjective health status was entered as a covariate in the analysis. The resulting MANCOVA was conducted to assess group differences across gender, partner status, disease course, and counseling seeking, after removing the effects of subjective health status.

Results yielded a significant multivariate main effect of gender \( (F_{(20, 293)} = 1.61, p < .05) \). Appendix P contains group means, standard deviations, and univariate F values.
for the twenty dependent variables for which gender differences were explored in this MANCOVA. Table 4.1 contains group means, standard deviations, and univariate F’s for the three dependent variables which yielded significant differences between groups based on gender. Univariate analyses revealed that females were more likely than males to utilize emotional release as a coping strategy ($F_{(1,312)} = 5.48, p < .05$). Females also indicated significantly higher levels of anxiety, as assessed by the BAI-PC ($F_{(1,312)} = 5.20, p < .05$). Females rated the usefulness of social support more highly than did males in the study ($F_{(1,312)} = 5.18, p < .05$).

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Note. * $p<.05$
** $p<.01$

Table 4.1. Means, standard deviations, and univariate $F$’s for dependent variables which yielded significant differences between groups based on gender. Note that three of the twenty dependent variables included in the MANCOVA yielded significant differences across gender.
Results of the MANCOVA also yielded a significant multivariate main effect of disease course ($F_{(20, 293)} = 3.71, p < .001$). Appendix Q contains group means, standard deviations, and univariate F values for the twenty dependent variables considered in this MANCOVA. Table 4.2 contains group means, standard deviations, and univariate F’s for the five dependent variables which yielded significant differences between groups based on disease course. Consistent with findings in the validation sample (Pakenham, 2001), univariate analyses revealed that respondents with progressive disease course were more likely to use physical assistance as a coping mechanism ($F_{(1,312)} = 29.62, p < .001$). Individuals with progressive forms of MS were also more likely to endorse harm appraisals ($F_{(1,312)} = 7.77, p < .01$) than were respondents with relapsing-remitting disease course. Individuals with a relapsing-remitting disease course indicated greater use of challenge appraisals ($F_{(1,312)} = 7.67, p < .01$). While participants with relapsing-remitting disease course exhibited significantly higher levels of life satisfaction ($F_{(1,312)} = 11.77, p = .001$), these patients also indicated higher levels of anxiety ($F_{(1,312)} = 5.08, p < .05$) than patients with a progressive disease course.
Results yielded a significant multivariate interaction between partnered status and counseling seeking ($F_{(20, 293)} = 1.63, p < .05$). Univariate analyses revealed that individuals who had never sought counseling were more likely to utilize physical assistance coping if they were living with a spouse or partner. However, individuals who had sought counseling were more likely to rely on physical assistance coping if they did not live with a spouse or partner ($F_{(1,312)} = 3.88, p = .05$). Univariate analyses revealed that respondents who had never sought counseling were more likely to utilize emotional
release as a coping mechanism if they were partnered, while individuals who had sought counseling were more likely to rely on emotional release coping if they were not living with a partner \((F_{(1,312)} = 8.50, p < .01)\).

4.2 Correlations

Pearson's product-moment correlation coefficients were calculated to examine the interrelationships among the measures included. Due to the large sample size, a substantial number of correlations reached statistical significance at the traditional \(p < .05\) level. In order to limit consideration of associations to those with practical significance, researchers examined correlations that were significant at the \(p < .01\) level. Table 4.3 presents the correlations between measures of coping, appraisal, personality, life satisfaction, depression, anxiety, mental health, social support, and self-reported disability in the entire sample of MS patients \((N = 329)\). Analysis of correlations revealed that the two coping strategies that most consistently related to adjustment outcome measures were problem solving and acceptance. Utilizing problem solving or acceptance coping was associated with positive adjustment (higher life satisfaction and mental health, lower depression and anxiety). Both problem solving and acceptance coping were also associated with decreased reliance on harm and threat appraisals, which were associated with negative adjustment outcomes. Conversely, utilization of challenge appraisals was associated with positive adjustment outcomes.
Continued

Table 4.3. Correlations between measures of coping, appraisal, personality, life satisfaction, depression, anxiety, mental health, and social support in the entire sample of MS patients \((N = 329)\).
Table 4.3 (continued)

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Note. * p < .01, Correlation is significant at the 0.001 level (2-tailed). Prob = problem solving coping, Phy = physical assistance coping, Emo = emotional release coping, Avo = avoidance coping, Pers = personal health control coping, Acc = acceptance coping, Ene = energy conservation coping, Har = harm appraisals, Thr = threat appraisals, Chal = challenge appraisals, Ext = extraversion, Neu = neuroticism, SW = Satisfaction with Life Scale, CES = Center for Epidemiologic Studies Depression Scale, BAI = Beck Anxiety Inventory for Primary Care, MHI = Mental Health Inventory, SSF = frequency of social support, SSU = utility of social support, SSA = availability of social support, SSD = desirability of social support, and EDS = total disability score.

Table 4.3. Correlations between measures of coping, appraisal, personality, life satisfaction, depression, anxiety, mental health, and social support in the entire sample of MS patients (N = 329).
Respondents who indicated high levels of extraversion were more likely to utilize problem solving coping, acceptance coping, and challenge appraisals. Those high in extraversion were also more likely to endorse high levels of life satisfaction and mental health. Respondents who indicated high levels of neuroticism were more likely to utilize threat appraisals and to endorse high levels of depression and anxiety. Interestingly, participant’s self-reported level of physical disability (as reported in the Self Administered Expanded Disability Status Scale; Bowen et al., 2001) was not significantly related to any measures of subjective well-being (r’s ranged from -.03 to .05).

Table 4.4 presents the correlations between measures of coping, appraisal, personality, life satisfaction, depression, anxiety, mental health, social support, and self-reported disability in individuals with progressive (n = 79) and relapsing-remitting forms of MS (n = 250). Overall, similar patterns of relationships were revealed in individuals with progressive and relapsing-remitting MS; however, some differences existed. Use of physical assistance coping was negatively related to life satisfaction among individuals with relapsing-remitting MS (r = -.25); however, this relationship was not present among individuals with progressive forms of MS (r = .06). Personal health control coping was positively related to mental health among individuals with progressive MS (r = .36) but was not significantly related to mental health among individuals with relapsing-remitting MS (r = .16). Availability of social support was related to increased reliance on emotional release coping among patients with relapsing-remitting MS (r = .32); however, the availability of social support demonstrated little relationship to emotional release coping among individuals with progressive forms of MS (r = .07).
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Note. *p < .01, Correlation is significant at the 0.001 level (2-tailed). Prob = problem solving coping, Phy = physical assistance coping, Emo = emotional release coping, Avo = avoidance coping, Pers = personal health control coping, Acc = acceptance coping, Ene = energy conservation coping, Har = harm appraisals, Thr = threat appraisals, Chal = challenge appraisals, Ext = extraversion, Neu = neuroticism, SW = Satisfaction with Life Scale, CES = Center for Epidemiologic Studies Depression Scale, BAI = Beck Anxiety Inventory for Primary Care, MHI = Mental Health Inventory, SSF = frequency of social support, SSU = utility of social support, SSA = availability of social support, SSD = desirability of social support, and EDS = total disability score.

Table 4.4. Correlations between measures of coping, appraisal, personality, life satisfaction, depression, anxiety, mental health, and social support in individuals with progressive forms of MS (above diagonal, n = 79) and relapsing-remitting forms of MS (below diagonal, n = 250).
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Note.  * p < .01, Correlation is significant at the 0.001 level (2-tailed). Prob = problem solving coping. Phy = physical assistance coping. Emo = emotional release coping. Avo = avoidance coping. Pers = personal health control coping. Acc = acceptance coping. Ene = energy conservation coping. Har = harm appraisals. Thr = threat appraisals. Chal = challenge appraisals. Ext = extraversion. Neu = neuroticism. SW = Satisfaction with Life Scale. CES = Center for Epidemiologic Studies Depression Scale. BAI = Beck Anxiety Inventory for Primary Care. MHI = Mental Health Inventory. SSF = frequency of social support. SSU = utility of social support. SSA = availability of social support. SSD = desirability of social support, and EDS = total disability score.

Table 4.4. Correlations between measures of coping, appraisal, personality, life satisfaction, depression, anxiety, mental health, and social support in individuals with progressive forms of MS (above diagonal, n = 79) and relapsing-remitting forms of MS (below diagonal, n = 250).
4.3 Regression Analysis

Separate hierarchical regression analyses were performed with each of the four adjustment outcomes as dependent variables (including depression, anxiety, mental health, and life satisfaction). Illness variables were entered first (including illness duration, health status, and degree of disability), followed by social support, appraisal variables (including harm, threat, and challenge), and coping variables (including problem solving, physical assistance, emotional release, avoidance, personal health control, acceptance, and energy conservation). Personality variables (including extraversion and neuroticism) were entered as a fifth block of variables in order to assess the predictive value of personality traits above and beyond the predictive value of all other variables. This analysis elucidated whether the inclusion of personality variables in structural equation models was warranted.

Because conducting multiple separate regression analyses increases family-wise error, an alpha level of .01 was utilized to determine statistical significance. Regression weights for each analysis are included in Table 4.5. Regression equations including illness variables, social support, cognitive appraisals, coping, and personality accounted for 53.8% of variance in depression scores, 48.3% of variance in anxiety scores, 66% of variance in mental health scores, and 42.9% of variance in life satisfaction scores.
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Note. **p<.01. Predictors included, MS Duration = time since diagnosis, Health Status = subjective health rating, Disability = EDSS score, Social Support = Social Support Questionnaire Score, Cognitive Appraisal of Health Scale subscales (Harm, Threat, Challenge Appraisals), Coping with Multiple Sclerosis Scale subscales (Problem Solving, Physical Assistance, Emotional Release, Avoidance, Personal Health Control, Acceptance, Energy Conservation), and Big Five Inventory subscales (Extraversion and Neuroticism).

Table 4.5. Weights resulting from hierarchical regression analysis of independent variables on depression, anxiety, mental health, and life satisfaction.
Table 4.6 illustrates the amount of variance accounted for by each block of variables in the hierarchical regression. Personality variables accounted for 11% of the variance in depression scores, 8% of variance in anxiety scores, 18% of variance in mental health scores, and 1% of variance in life satisfaction scores. Personality variables explained a significant amount of variance in depression, anxiety, and mental health above and beyond the variance accounted for by other variables ($p < .01$).

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Note. *$p<.01$. P value represents significance of change in $F$ value by the addition of each block of variables. Illness variables included time since diagnosis, subjective health rating, and disability score. Cognitive Appraisals included harm, threat, and challenge appraisal subscales. Coping included problem solving, physical assistance, emotional release, avoidance, personal health control, acceptance, and energy conservation subscales. Personality included extraversion and neuroticism subscales.

Table 4.6. Variance in adjustment outcomes that was accounted for by each set of predictor variables and corresponding $F$ value.
4.4 Factor Analysis of the Coping with Multiple Sclerosis Scale (Pakenham, 2001)

Exploratory factor analysis (EFA) with target rotation was utilized to determine the factor structure of the CMSS (Pakenham, 2001). EFA was conducted on the correlation matrix between CMSS items, using the maximum likelihood (ML) criterion for parameter estimation (see Factor Analysis of CMSS in Methods section). This EFA yielded an unrotated matrix of factor loadings. A target matrix was specified, containing the pattern of expected loadings based on the original validation of the scale. An oblique target rotation extracting seven factors, one for each coping subscale, was conducted on the resulting factor loading matrix. This allowed for examination of the structure of the data to confirm the choice of subscales. The root mean square error of approximation (RMSEA) indicated that the data exhibited close fit to the factor structure specified by Pakenham (2001) (RMSEA = 0.024, 90% CI {0.009; 0.035}). Table 4.7 illustrates the rotated factor matrix based on this target rotation.
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Note: Loadings allowed to be high by the target matrix are indicated in bold. Items which do not load highly onto the expected factor are shaded in gray.

Table 4.7. Rotated factor loadings of CMSS data based on the target matrix specified by the original validation of the scale (Pakenham, 2001).
EFA indicated that, with the exception of two items, all items on the CMSS load most highly onto the expected factor. The problem solving subscale contained two items (item 12 and item 22) which yielded higher loadings for the acceptance factor ($\lambda_{12} = .39$ and $\lambda_{22} = .38$) than for the problem solving factor ($\lambda_{12} = .28$ and $\lambda_{22} = .33$). This analysis indicated that item 12 (“I focus on the here and now.”) and item 24 (“I try to get something positive out of it.”) may be measuring acceptance of the limitations of MS, rather than problem solving behavior.

Because researchers concluded that these items may be meaningful additions to the acceptance subscale, another EFA with target rotation was conducted on the CMSS data. A new target matrix was specified, which included high loadings for items 12 and 24 on the acceptance factor, as opposed to the problem solving factor. Table 4.8 illustrates the rotated factor matrix for CMSS items based on the new target matrix. The resulting matrix of rotated loadings indicated that 5 of the 29 items were misspecified, as they loaded more highly onto another factor than they did onto the expected factor. The pattern of loadings from this analysis (see Table 4.8) indicated that the new target matrix specified in this study was less accurate than the original matrix specified by Pakenham (2001). Several other target rotations were conducted with alternative target matrices, in order to find a more appropriate target matrix for CMSS data. New target matrices were developed by adjusting the original target matrix, based on the results of previous rotations and the theoretical meaning of the items. However, none of the subsequent rotations yielded more expected loadings than the original target matrix. Consequently, Pakenham’s subscales were utilized in the analyses in the current study.
<table>
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Note: Loadings allowed to be high by the target matrix are indicated in bold. Items which do not load highly onto the expected factor are shaded in gray.

Table 4.8. Rotated factor loadings of CMSS data based on the target matrix specified by the first rotation of CMSS data in the current study.
The oblique rotation utilizing the target matrix specified by the original validation of the CMSS (Pakenham, 2001) yielded a correlation matrix among the seven first order factors or subscales of the CMSS (see Table 4.9). Correlations between the factors were primarily low (r’s ranging from .00 to .30), with the exception of the correlation between problem solving and acceptance (r = .38).

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<td></td>
</tr>
<tr>
<td>Energy Cons.</td>
<td>.27</td>
<td>.30</td>
<td>.03</td>
<td>.01</td>
<td>.14</td>
<td>.19</td>
<td>1</td>
</tr>
</tbody>
</table>


Table 4.9. Correlation between first order factors of the Coping with Multiple Sclerosis Scale (CMSS).
4.5 Factor Analysis of the Big Five Inventory (BFI; John et. al, 1991).

In order to determine appropriate indicators for the latent variables of neuroticism and extraversion, exploratory factor analysis (EFA) was utilized to partition the eight neuroticism items and eight extraversion items into parcels. EFA was conducted on the correlation matrix between the eight neuroticism items, using the maximum likelihood (ML) criterion for parameter estimation (see Factor Analysis of BFI in Methods section). Three runs were conducted which extracted two, three, and four factors respectively. Oblique rotation was conducted on each of the three resulting factor loading matrices, utilizing the CF-Parsimax criterion. Table 4.10 contains the fit indices resulting from each EFA run; including the sample discrepancy function value, chi square statistic, root mean square error of approximation (RMSEA), and confidence interval (CI) for RMSEA.

<table>
<thead>
<tr>
<th>M</th>
<th>F hat</th>
<th>$\chi^2$</th>
<th>df</th>
<th>p &gt;</th>
<th>RMSEA</th>
<th>CI for RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.121</td>
<td>39.64</td>
<td>13</td>
<td>0.000</td>
<td>0.079</td>
<td>(0.052; 0.108)</td>
</tr>
<tr>
<td>3</td>
<td>0.031</td>
<td>10.14</td>
<td>7</td>
<td>0.181</td>
<td>0.037</td>
<td>(0.000; 0.079)</td>
</tr>
<tr>
<td>4</td>
<td>0.003</td>
<td>1.071</td>
<td>2</td>
<td>0.585</td>
<td>0.000</td>
<td>(0.000; 0.191)</td>
</tr>
</tbody>
</table>

Note. M = number of factors extracted, F hat = sample discrepancy function value, $\chi^2$ = chi square statistic, df = degrees of freedom, p = significance level for the test of exact fit, RMSEA = root mean square error of approximation, and CI for RMSEA = confidence intervals for root mean square error of approximation.

Table 4.10. Fit indices for each EFA run on the correlation matrix of neuroticism items of the Big Five Inventory (BFI).
The decision as to the number of factors to retain was based on the RMSEA and interpretability of factor loadings. According to Browne & Cudeck (1992), population RMSEA values between .05 and .08 indicated reasonable fit to the population. The EFA extracting three factors from the neuroticism data yielded an RMSEA point estimate of 0.037 (90% CI {0.000; 0.079}). These results indicated that extracting three factors from the neuroticism data yielded at least reasonable fit to the population, because we can conclude that the population RMSEA is likely to be less than .08.

The rotated factor loading matrix for the EFA which extracted three factors from the neuroticism data yielded a factor which consisted of only one item (see Table 4.11). However, the single item factor yielded high correlations with the other two factors ($r = .48$ and .50 for factor one and two, respectively) (see Table 4.12 for a matrix of correlations between factors). Consideration of other solutions revealed unacceptable fit for the 2-factor and 4-factor solutions, as indicated by RMSEA values which could not reasonably be assumed to be less than 0.10 in the population (90% CI {0.052; 0.108} for the 2-factor solution and 90% CI {0.000; 0.191} for the 4-factor solution). Therefore, researchers chose to retain three factors.
Table 4.11. Matrix of rotated factor loadings for EFA of neuroticism data when three factors were extracted utilizing the CF-Parsimax criterion.

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 2</td>
<td>0.25</td>
<td><strong>0.45</strong></td>
<td>0.06</td>
</tr>
<tr>
<td>Item 4</td>
<td>0.21</td>
<td><strong>0.40</strong></td>
<td>0.36</td>
</tr>
<tr>
<td>Item 6</td>
<td>0.41</td>
<td><strong>0.37</strong></td>
<td>-0.04</td>
</tr>
<tr>
<td>Item 8</td>
<td><strong>0.63</strong></td>
<td>0.18</td>
<td>0.03</td>
</tr>
<tr>
<td>Item 10</td>
<td>-0.03</td>
<td><strong>0.59</strong></td>
<td>0.33</td>
</tr>
<tr>
<td>Item 12</td>
<td>0.23</td>
<td><strong>0.45</strong></td>
<td>0.07</td>
</tr>
<tr>
<td>Item 14</td>
<td>0.02</td>
<td>0.01</td>
<td><strong>0.83</strong></td>
</tr>
<tr>
<td>Item 16</td>
<td><strong>0.62</strong></td>
<td>-0.09</td>
<td>0.30</td>
</tr>
</tbody>
</table>

Note. The highest loading for each item is indicated in bold.

Three homogeneous parcels were constructed for neuroticism, such that each parcel consisted of items which loaded highly onto one first-order factor (see loadings in Table 4.11). The first parcel consisted of items 6, 8, and 16. The second parcel included items 2, 4, 10, and 12. The third parcel consisted of item 14. These three parcels each represented first-order factors, which in turn loaded onto the second-order factor of neuroticism.

The rotation extracting three factors from the neuroticism data yielded a matrix of correlations between the three first-order factors, or parcels (see Table 4.12). All factors were highly correlated with each other ($r$’s ranging from .48 to .54), which indicates that the three parcels assess constructs that are highly related to one another.
Table 4.12. Correlation between first order factors for neuroticism, as assessed by the Big Five Inventory (BFI).

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2</td>
<td>.54</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Factor 3</td>
<td>.48</td>
<td>.50</td>
<td>1</td>
</tr>
</tbody>
</table>

A similar EFA was conducted on the matrix of correlations between the eight extraversion BFI items to determine how the items would be partitioned into several indicators of extraversion. EFA was conducted on the correlation matrix between the eight extraversion items (see Factor Analysis of BFI in Methods section). Three runs were conducted which extracted two, three, and four factors respectively. Oblique rotation was conducted on each of the three resulting factor loading matrices, utilizing the CF-Parsimax criterion. Table 4.13 contains the fit indices resulting from each EFA run on the extraversion data; including the sample discrepancy function value, chi square statistic, root mean square error of approximation (RMSEA), and confidence interval for RMSEA.
<table>
<thead>
<tr>
<th>$M$</th>
<th>$F\text{ hat}$</th>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$p &gt;$</th>
<th>RMSEA</th>
<th>CI for RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.138</td>
<td>45.518</td>
<td>13</td>
<td>0.000</td>
<td>0.087</td>
<td>(0.061; 0.116)</td>
</tr>
<tr>
<td>3</td>
<td>0.048</td>
<td>15.789</td>
<td>7</td>
<td>0.027</td>
<td>0.052</td>
<td>(0.020; 0.072)</td>
</tr>
<tr>
<td>4</td>
<td>0.015</td>
<td>5.144</td>
<td>2</td>
<td>0.076</td>
<td>0.069</td>
<td>(0.000; 0.146)</td>
</tr>
</tbody>
</table>

Note. $M =$ number of factors extracted, $F\text{ hat}$ = sample discrepancy function value, $\chi^2 =$ chi square statistic, $df$ = degrees of freedom, $p =$ significance level for the test of close fit, RMSEA = root mean square error of approximation, and CI for RMSEA = confidence intervals for root mean square error of approximation.

Table 4.13. Fit indices for each EFA run on the correlation matrix of extraversion items of the Big Five Inventory (BFI).

As with the neuroticism data, the decision as to the number of factors to retain was based on the RMSEA and interpretability of factor loadings. According to Browne & Cudeck (1992), population RMSEA values between .05 and .08 indicated reasonable fit to the population. Extracting three factors from the extraversion data yielded an RMSEA point estimate of 0.052 (90% CI {0.020; 0.072}). These results indicate that extracting three factors from the extraversion data yielded at least reasonable fit to the population, because we can conclude that the population RMSEA is likely to be less than or equal to 0.08.

The rotated factor loading matrix for the EFA of extraversion items yielded three factors, one of which consisted of a single item (see Table 4.14). However, the single item factor yielded reasonably high correlations with the other two factors ($r = .53$ and
.36 for factor one and three, respectively) (see Table 4.15 for a matrix of correlations between factors). Consideration of other solutions revealed unacceptable fit for the 2-factor and 4-factor solutions, as indicated by RMSEA values which could not reasonably be assumed to be less than 0.10 in the population (90% CI {0.061; 0.116} for the 2-factor solution and 90% CI {0.000; 0.146} for the 4-factor solution). Therefore, researchers chose to retain three factors.

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td><strong>0.67</strong></td>
<td>-0.02</td>
<td>0.17</td>
</tr>
<tr>
<td>Item 3</td>
<td><strong>0.53</strong></td>
<td>0.24</td>
<td>0.14</td>
</tr>
<tr>
<td>Item 5</td>
<td>-0.10</td>
<td>0.08</td>
<td><strong>0.55</strong></td>
</tr>
<tr>
<td>Item 7</td>
<td>0.03</td>
<td>-0.01</td>
<td><strong>0.78</strong></td>
</tr>
<tr>
<td>Item 9</td>
<td><strong>0.73</strong></td>
<td>0.21</td>
<td>-0.01</td>
</tr>
<tr>
<td>Item 11</td>
<td>0.22</td>
<td>0.18</td>
<td><strong>0.35</strong></td>
</tr>
<tr>
<td>Item 13</td>
<td>-0.03</td>
<td><strong>1.00</strong></td>
<td>-0.02</td>
</tr>
<tr>
<td>Item 15</td>
<td>0.26</td>
<td>0.25</td>
<td><strong>0.39</strong></td>
</tr>
</tbody>
</table>

Note. The highest loading for each item is indicated in bold.

Table 4.14. Matrix of rotated factor loadings for EFA of extraversion data when three factors were extracted utilizing the CF-Parsimax criterion.
Items which loaded highly onto each first-order factor were separated to form three homogeneous parcels for extraversion (see Table 4.14). The first parcel consisted of items 1, 3, and 9. The second parcel contained only item 13. The third parcel consisted of items 5, 7, 11, and 15. These three parcels each represented first-order factors, which in turn loaded onto the second-order factor termed extraversion.

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2</td>
<td>.53</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Factor 3</td>
<td>.42</td>
<td>.36</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.15. Correlation between first order factors for extraversion, as assessed by the Big Five Inventory (BFI).
4.6 Unrestricted Factor Analysis of Manifest Variables

Exploratory factor analysis (EFA) with target rotation was utilized to determine which manifest variables loaded highly onto each hypothesized latent variable. EFA was conducted on the correlation matrix between subscale scores, using the maximum likelihood (ML) criterion for parameter estimation and extracting six factors. This EFA yielded an unrotated matrix of factor loadings. An oblique target rotation was conducted (see Unrestricted Factor Analysis of Manifest Variables in Methods section). This allowed for examination of the structure of the data to confirm the choice of indicators for each latent variable. Table 4.16 illustrates the rotated factor matrix for manifest variables based on this target rotation.
Table 4.16. Rotated factor loading matrix for unrestricted factor analysis of manifest variables onto latent factors.
EFA indicated that 6 of the 24 manifest variables in this analysis did not serve as clear indicators of the latent variable they were intended to measure, because they did not load most highly onto the anticipated factor. Four indicators of coping loaded more highly onto other latent factors than onto the coping factor. These included the physical assistance subscale (λ = .39 for coping and λ = .44 for neuroticism), emotional release subscale (λ = .16 for coping and λ = .37 for cognitive appraisal), avoidance subscale (λ = .04 for coping and λ = -.19 for adjustment), and energy conservation subscale of the CMSS (λ = .18 for coping and λ = .28 for neuroticism). Life satisfaction (as assessed by the SWLS) yielded a higher loading on neuroticism (λ = -.41) than on its intended latent factor, adjustment (λ = .34). Desirability of social support, as assessed by the Social Support Questionnaire, loaded more highly onto coping (λ = .30) than onto the expected factor, social support (λ = .29).

This analysis indicated that the problem solving, emotional release, avoidance, and energy conservation subscales of the CMSS were not strong indicators of coping in this sample because they each served as stronger indicators of various other latent variables in the model. For the same reason, the SWLS and desirability subscale of the Social Support Questionnaire were not strong indicators of adjustment and social support, respectively. Because this analysis revealed that these six scales were not strong indicators of their respective latent variables, problem solving, emotional release, avoidance, energy conservation, life satisfaction, and desirability of social support were excluded from use in the measurement models.
The fact that four subscales of the Coping with Multiple Sclerosis Scale (CMSS) did not serve as strong indicators of coping in the model suggests the CMSS subscales did not capture aspects of coping which are closely related to one another. Although the scale has proven to validly assess coping strategies used by MS patients (Pakenham, 2001), the failure of the majority of CMSS subscales to fit into the measurement model indicates that the CMSS may not be the optimal instrument for assessing the role of coping in a model of adjustment to MS-related stress.

4.7 Structural Equation Modeling

Measurement models for the traditional direct effects model (see Figure S.5), traditional stress buffering model (see Figure S.6), personality direct effects model (see Figure S.7), and personality stress buffering model (see Figure S.8) were specified. A matrix of correlations between the 12 manifest variables in each model was constructed. Correlation coefficients were reported to three decimal places to allow for replication of SEM procedures by subsequent researchers (see Appendix R). The matrix of correlations between manifest variables was analyzed via structural equation modeling (SEM) procedures to assess the appropriateness of the proposed models (see Structural Equation Modeling in Methods section for a description of measurement models and SEM procedures).

Measurement models were specified for the two predominant models in the stress and coping literature, the traditional direct effects model and the traditional stress buffering model (see Figures S.5 and S.6, respectively). Results indicated that neither
The model demonstrated acceptable fit in the current study. The traditional direct effects model (Figure S.5) yielded a point estimate for RMSEA of .127 (90% confidence interval {.114, .141}). Point estimates and confidence intervals for each free parameter of the traditional direct effects model are included in Table 4.17.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Point Estimate</th>
<th>90% Confidence Interval</th>
<th>Parameter</th>
<th>Point Estimate</th>
<th>90% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_1$</td>
<td>.77</td>
<td>.71 to .83</td>
<td>$\phi_1$</td>
<td>.41</td>
<td>.33 to .51</td>
</tr>
<tr>
<td>$\beta_2$</td>
<td>.78</td>
<td>.72 to .84</td>
<td>$\phi_2$</td>
<td>.39</td>
<td>.31 to .49</td>
</tr>
<tr>
<td>$\beta_3$</td>
<td>-.62</td>
<td>-.69 to -.55</td>
<td>$\phi_3$</td>
<td>.61</td>
<td>.53 to .71</td>
</tr>
<tr>
<td>$\beta_4$</td>
<td>.97</td>
<td>.95 to .99</td>
<td>$\phi_4$</td>
<td>.07</td>
<td>.04 to .12</td>
</tr>
<tr>
<td>$\beta_5$</td>
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<td>-.91 to -.74</td>
<td>$\phi_5$</td>
<td>.22</td>
<td>.18 to .27</td>
</tr>
<tr>
<td>$\beta_6$</td>
<td>-.78</td>
<td>-.82 to -.74</td>
<td>$\phi_6$</td>
<td>.40</td>
<td>.34 to .46</td>
</tr>
<tr>
<td>$\beta_7$</td>
<td>.39</td>
<td>.30 to .48</td>
<td>$\phi_7$</td>
<td>.85</td>
<td>.78 to .92</td>
</tr>
<tr>
<td>$\beta_8$</td>
<td>.70</td>
<td>.62 to .78</td>
<td>$\phi_8$</td>
<td>.51</td>
<td>.41 to .64</td>
</tr>
<tr>
<td>$\beta_9$</td>
<td>.84</td>
<td>.76 to .92</td>
<td>$\phi_9$</td>
<td>.29</td>
<td>.18 to .46</td>
</tr>
<tr>
<td>$\beta_{10}$</td>
<td>.93</td>
<td>.92 to .94</td>
<td>$\phi_{10}$</td>
<td>.14</td>
<td>.12 to .16</td>
</tr>
<tr>
<td>$\beta_{11}$</td>
<td>.56</td>
<td>.49 to .62</td>
<td>$\phi_{11}$</td>
<td>.69</td>
<td>.62 to .76</td>
</tr>
<tr>
<td>$\beta_{12}$</td>
<td>1.00</td>
<td>1.00 to 1.00</td>
<td>$\phi_{12}$</td>
<td>.00</td>
<td>.00 to .00</td>
</tr>
<tr>
<td>$\beta_{13}$</td>
<td>-.53</td>
<td>-.60 to -.45</td>
<td>$\phi_{13}$</td>
<td>.54</td>
<td>.45 to .62</td>
</tr>
<tr>
<td>$\beta_{14}$</td>
<td>.21</td>
<td>.13 to .28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta_{15}$</td>
<td>.38</td>
<td>.30 to .46</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.17. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the traditional direct effects model. See Figure S.5 for an illustration of which relationships correspond to each parameter estimate.
The traditional stress buffering model (Figure S.6) yielded an RMSEA point estimate of .114 (90% confidence interval {.101, .127}). Point estimates and confidence intervals for each free parameter of the traditional stress buffering model are included in Table 4.18. As expected, the traditional stress buffering model yielded better fit to the data than the traditional direct effects model. In addition, the strength of the relationship between coping and adjustment markedly increased from the traditional direct effects model ($\beta_{19} = .38$, 90% CI {.30; .46}) to the traditional stress buffering model ($\beta_{19} = .71$, 90% CI {.65; .76}), indicating that coping buffers the negative effects of cognitive appraisals on adjustment. Because the RMSEA value exceeded .10 in both cases, accepted guidelines for interpretation indicate that both models fit poorly for the population under consideration (Browne & Cudeck, 1993).
Table 4.18. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the traditional stress buffering model. See Figure S.6 for an illustration of which relationships correspond to each parameter estimate.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Point Estimate</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
<th>Parameter</th>
<th>Point Estimate</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_1$</td>
<td>.65</td>
<td>.59</td>
<td>.71</td>
<td>$\phi_1$</td>
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<td>.66</td>
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<tr>
<td>$\beta_2$</td>
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<td>.72</td>
<td>.82</td>
<td>$\phi_2$</td>
<td>.41</td>
<td>.35</td>
<td>.50</td>
</tr>
<tr>
<td>$\beta_3$</td>
<td>-.63</td>
<td>-.69</td>
<td>-.56</td>
<td>$\phi_3$</td>
<td>.61</td>
<td>.53</td>
<td>.70</td>
</tr>
<tr>
<td>$\beta_4$</td>
<td>.97</td>
<td>.96</td>
<td>.99</td>
<td>$\phi_4$</td>
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<td>.03</td>
<td>.10</td>
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<td>-.92</td>
<td>-.87</td>
<td>$\phi_5$</td>
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<td>.16</td>
<td>.25</td>
</tr>
<tr>
<td>$\beta_6$</td>
<td>-.80</td>
<td>-.83</td>
<td>-.76</td>
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<td>.21</td>
<td>.39</td>
<td>$\phi_7$</td>
<td>.91</td>
<td>.86</td>
<td>.97</td>
</tr>
<tr>
<td>$\beta_8$</td>
<td>.71</td>
<td>.66</td>
<td>.77</td>
<td>$\phi_8$</td>
<td>.50</td>
<td>.42</td>
<td>.58</td>
</tr>
<tr>
<td>$\beta_9$</td>
<td>.61</td>
<td>.54</td>
<td>.68</td>
<td>$\phi_9$</td>
<td>.63</td>
<td>.55</td>
<td>.71</td>
</tr>
<tr>
<td>$\beta_{10}$</td>
<td>.93</td>
<td>.92</td>
<td>.94</td>
<td>$\phi_{10}$</td>
<td>.14</td>
<td>.12</td>
<td>.16</td>
</tr>
<tr>
<td>$\beta_{11}$</td>
<td>.56</td>
<td>.49</td>
<td>.62</td>
<td>$\phi_{11}$</td>
<td>.69</td>
<td>.62</td>
<td>.76</td>
</tr>
<tr>
<td>$\beta_{12}$</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>$\phi_{12}$</td>
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<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>$\beta_{13}$</td>
<td>-.99</td>
<td>-1.00</td>
<td>-.98</td>
<td>$\phi_{13}$</td>
<td>.46</td>
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<td>.21</td>
<td>.14</td>
<td>.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta_{15}$</td>
<td>.71</td>
<td>.65</td>
<td>.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Measurement models for the direct effects and buffering models which incorporated personality variables (see Figures S.7 and S.8, respectively) were also specified. The personality direct effects model (Figure S.7) demonstrated poor fit in the population, as lower bound of the 90% confidence interval for RMSEA exceeded .10 (RMSEA = .118 and 90% CI {.110, .127}). Although the point estimate for the RMSEA
of the personality stress buffering model (Figure S.8) also indicated poor fit (RMSEA = .100), the lower bound of the 90% confidence interval indicated that this model may demonstrate mediocre fit in the population, as indicated by an RMSEA value less than .10 (90% CI {.092, .109}). This indicates that the personality stress buffering model (Figure S.8) most closely fits the population, as compared to other proposed models. Although the RMSEA coefficients are high for all hypothesized models, these analyses provide insight into the processes described by the models.

It is important to note that incorporation of personality factors into the personality direct effects model (Figure S.7, RMSEA = .118 and 90% CI {.110, .127}) improved model fit over the traditional direct effects model (Figure S.5, RMSEA = .127 and 90% CI {.114, .141}). Additionally, inclusion of personality variables in the personality stress buffering model (Figure S.8, RMSEA = .100 and 90% CI {.092, .109}) improved model fit over the traditional stress buffering model (Figure S.6, RMSEA = .114 and 90% CI {.101, .127}). Because RMSEA favors model parsimony by penalizing complex models, the superior model fit of the models incorporating personality indicates that adding model complexity substantially improved model fit (Browne & Cudeck, 1993).

Because the personality stress buffering model yielded an RMSEA on the bounds of acceptability, the plausibility of hypothesized relationships in the model was examined. Point estimates and confidence intervals for each free parameter of the personality stress buffering model are included in Table 4.19. Point estimates for free parameters representing linear relationships are included in Figure S.9.
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Table 4.19. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the personality stress buffering model. See Figure S.8 for an illustration of which relationships correspond to each parameter estimate.
SEM analysis yielded a parameter estimate of .84 (90% CI [.80; .88]) for the linear relationship between coping and adjustment, which indicates a strong relationship between utilization of coping strategies and experience of positive adjustment outcomes. Additionally, the analysis demonstrated high parameter estimates for the linear relationships between cognitive appraisal and coping ($\beta_{19} = -.47, 90\% \text{ CI} [-.56; -.37]$), as well as neuroticism and coping ($\beta_{23} = -.56, 90\% \text{ CI} [.65; .47]$). While these strong relationships seem to provide supporting evidence for the buffering effects of coping, examination of the personality direct effects model indicates that incorporation of some direct effects would likely improve the fit of the personality stress buffering model.

In order to assess the direct relationship between personality and adjustment, I examined parameter estimates for the personality direct effects model (Figure S.7). Point estimates and confidence intervals for each free parameter of the personality direct effects model are included in Table 4.20. Point estimates for free parameters representing linear relationships are illustrated in Figure S.10. SEM analyses of the personality direct effects model yielded a parameter estimate of .20 (90% CI [.12; .27]) for the linear relationship between coping and adjustment. The marked decrease in this loading in the personality direct effects model ($\beta_{23} = .20, 90\% \text{ CI} [.12; .27]$), as compared to the stress buffering model ($\beta_{26} = .84, 90\% \text{ CI} [.80; .88]$), supports the notion that coping buffers the effects of other variables on adjustment. SEM analysis of the personality direct effects model also yielded a parameter estimate for the direct relationship between neuroticism and adjustment of -.68 (90% CI [-.73; -.62]). Because the loading for the direct relationship between neuroticism and adjustment was markedly higher than all other loadings
between latent variables in the personality direct effects model (Figure S.10), I chose to incorporate this direct relationship into a new model which integrates both direct and stress buffering effects on adjustment.

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Table 4.20. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the personality direct effects model. See Figure S.7 for an illustration of which relationships correspond to each parameter estimate.
The personality mixed effects model (Figure S.11) was specified by removing the linear relationship between neuroticism and coping, while adding a direct relationship between neuroticism and adjustment. This model combines the buffering effects of coping on adjustment with the direct effects of neuroticism and social support on adjustment. The measurement model for the personality mixed effects model is illustrated in Figure S.12. This statistical representation of the model contains 6 latent variables, 18 manifest variables, and 22 error terms. Parameter estimates for linear relationships between error terms and manifest variables were fixed at one. The variance of each latent variable was also fixed at one. SEM procedures were used to determine parameter estimates for 8 linear relationships between latent variables, 18 linear relationships between latent variables and manifest variables, and 22 variance terms. SEM analysis was conducted on the personality mixed effects model (Figure S.12), utilizing the original data. Because the original data set was utilized for model modification, specification of the personality mixed effects model should be considered exploratory, and not confirmatory, in nature.

Results of the SEM analysis yielded an RMSEA point estimate of .091 (90% CI {0.082, 0.099}) for the personality mixed effects model (Figure S.11), which indicates mediocre fit (Browne & Cudeck, 1993). The incorporation of a direct relationship between neuroticism and adjustment produced marked improvement in fit (RMSEA = .091, ECVI = 1.722), as compared to the original personality stress buffering model (RMSEA = .100, ECVI = 1.928). The personality mixed effects model demonstrated superior fit to all other models considered (see Table 4.21 for fit indices for all models).
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Note. $F \; hat$ = sample discrepancy function value, $\chi^2$ = chi square statistic, $df$ = degrees of freedom, RMSEA = root mean square error of approximation, and CI for RMSEA = confidence intervals for root mean square error of approximation.

Table 4.21. Fit indices for the all models considered in SEM analyses. Models include the traditional direct effects model, the traditional stress buffering model, the personality direct effects model, the personality stress buffering model and the personality mixed effects model.

Because the personality mixed effects model fits reasonably well, I examined parameter estimates to consider the plausibility of hypothesized relationships in the model. Point estimates and confidence intervals for each free parameter are included in Table 4.22. Figure S.13 illustrates point estimates for all free parameters representing linear relationships.
Table 4.22. Point estimates and confidence intervals for parameter estimates resulting from SEM analysis of the personality mixed model. See Figure S.12 for an illustration of which relationships correspond to each parameter estimate.
SEM analyses of the personality mixed effects model yielded a parameter estimate of .28 for the linear relationship between coping and adjustment. Removing the buffering effect of coping between neuroticism and adjustment, as well as adding the direct relationship between neuroticism and adjustment, resulted in a marked decrease in loading between coping and adjustment in the personality mixed effects model ($\beta_{26} = .28, 90\% \text{ CI} \{.21, .36\}$), as compared to the stress buffering model ($\beta_{26} = .84, 90\% \text{ CI} \{.80, .88\}$). This supports the notion that a considerable amount of the buffering effect of coping can be explained by the direct relationship between neuroticism and adjustment. This interpretation is further supported by the magnitude of the direct relationship between neuroticism and adjustment ($\beta_{23} = -.62, 90\% \text{ CI} \{-.69, -.56\}$). This indicates a strong inverse relationship between reliance on harmful cognitive appraisals (e.g., harm and threat appraisals) and experience of positive adjustment outcomes (e.g., high mental health, low depression and anxiety).

Once the buffering effect of coping on neuroticism was removed from the model, the personality mixed effects model yielded a markedly higher loading between cognitive appraisals and coping ($\beta_{19} = -.74, 90\% \text{ CI} \{-.81, -.66\}$), as compared to the personality stress buffering model ($\beta_{19} = -.47, 90\% \text{ CI} \{-.56, -.37\}$). This suggests that the buffering effects of coping on cognitive appraisals were being masked by the effect of neuroticism in the personality stress buffering model (Figure S.9).

Even though the buffering effect of coping appeared to diminish in the personality mixed effects model, the loading between coping and adjustment in this model ($\beta_{26} = .28, 90\% \text{ CI} \{.21, .36\}$) increased, as compared to loading between coping and adjustment in
the personality direct effects model ($\beta_{23} = .20$, 90% CI {.12; .27}). This further supports the notion that although a considerable amount of the buffering effect of coping can be explained by the direct relationship between neuroticism and adjustment, coping does appear to have a buffering effect on extraversion and cognitive appraisals. This suggests that extraversion and cognitive appraisals predict the extent to which use of coping strategies will lead to positive adjustment outcomes (e.g., high mental health, low depression and anxiety).

The remaining relationships between latent variables in the personality mixed effects model (Figure S.12) were consistent with those in the personality stress buffering model (Figure S.9). SEM analysis yielded moderate relationships between extraversion and coping ($\beta_{20} = .21$, 90% CI {.11, .30}), extraversion and social support ($\beta_{21} = .20$, 90% CI {.11, .30}), social support and adjustment ($\beta_{25} = .17$, 90% CI {.12, .23}), and neuroticism and social support ($\beta_{24} = -.18$, 90% CI {-.27, -.09}). The relationship between neuroticism and cognitive appraisals ($\beta_{22} = .65$, 90% CI {.58, .72}) indicates that individuals who score high on neuroticism are likely to utilize less productive cognitive appraisals (e.g., challenge appraisals) and more harmful cognitive appraisals (e.g., harm and threat appraisals).
CHAPTER 5
DISCUSSION

Results of the present study indicate that exploring variables which may lead to positive coping outcomes in multiple sclerosis (MS) patients is critical, because this population is particularly at risk for poor psychological outcomes. MS patients in the current investigation exhibited lower life satisfaction and mental health, while indicating greater levels of anxiety and depression than the general population. These findings are consistent with the multiple sclerosis literature, which indicates that MS patients are particularly at risk for experiencing negative adjustment outcomes (Arnett et al., 2002; Sadovnick et al., 1991). For this reason, research exploring factors that may lead to successful coping for these patients is vital.

Within the MS population, certain characteristics render patients at increased risk for negative outcomes. In the current investigation, females were more likely than males to experience high levels of anxiety, even after controlling for health status. This suggests that female MS patients are particularly at risk for negative adjustment outcomes, regardless of their health status. Additionally, patients who experienced a progressive disease course were more likely to report low life satisfaction and increased
use of harm appraisals (which are associated with negative outcomes), even after controlling for subjective health status. This indicates that patients with progressive forms of MS are also at increased risk for negative adjustment. Because patients with a progressive disease course have a poorer prognosis, and therefore hold negative expectations about their disease course, it can be expected that these patients will generally experience negative psychological adjustment.

The only negative outcome which was higher among patients with relapsing-remitting multiple sclerosis (RRMS) than those with progressive forms of MS was anxiety. Higher levels of anxiety among RRMS patients likely result from the unpredictable, constantly changing, nature of relapsing-remitting multiple sclerosis. Because physicians cannot predict when a relapse will occur, RRMS patients are forced to struggle with constant uncertainty about their health and disease course. It can be expected that this unpredictability might cause apprehension and anxiety in RMSS patients.

5.1 Influence of Controllable Factors

Although gender and disease course (progressive or relapsing) are variables that are beyond the control of patients and treatment providers, results from the present study suggest that the majority of variables which relate to adjustment outcomes are controllable. Among MS patients in the current investigation, positive adjustment outcomes (e.g., high life satisfaction and mental health, low depression and anxiety) were associated with increased use of problem solving or acceptance coping, increased reliance
on challenge appraisals, and decreased reliance on harm or threat appraisals.

Interestingly, MS patients’ level of physical disability was not significantly related to any measures of psychological adjustment. This finding is consistent with the literature, which holds that patients’ level of subjective distress bears little relationship to the severity of their physical symptoms (Wineman, 1990; Warren et al., 1991).

These findings imply that the psychological adjustment of MS patients is more related to controllable cognitive and behavioral factors (e.g., coping strategies and cognitive appraisals) than to the unpredictable physical effects of the disease. The strong association between psychological adjustment and cognitive-behavioral factors in this study suggests that treatment providers may be able to improve psychological adjustment among MS patients by encouraging the use of adaptive cognitive and behavioral strategies. It is important to note that the present study was correlational in nature; and therefore, we cannot conclude causation. However, the clear association between cognitive behavioral factors and adjustment suggests that cognitive-behavioral therapy (CBT) may prove effective in improving adjustment outcomes in this population. Recent research indicates that CBT can yield significant improvements over supportive, emotion-focused therapy with MS patients (Mohr, Hart, Julian, Catledge, Honos-Webb, Vella, & Tasch, 2005). Future research should investigate the utility of CBT with MS patients.
5.2 Importance of Incorporating Personality

Because previous studies support the notion that cognitive and behavioral factors affect adjustment to multiple sclerosis, many researchers have sought to develop a comprehensive model of coping with MS-related stress (Antonak & Livneh, 1995; McReynolds et al., 1999; Pakenham, 1999). Models which utilize illness variables, cognitive appraisals, coping strategies, and social support to predict adjustment have yielded considerable success in explaining adjustment among MS patients (Pakenham, 1999). Consistent with previous findings and with expectations, cognitive appraisals, coping, and social support significantly predicted adjustment outcomes in the present study. These results provide further support for the notion that cognitive and behavioral factors are important in determining psychological adjustment in this population.

However, despite consistent evidence that cognitive and behavioral variables explain a significant amount of variation in adjustment to MS, individual differences exist which cannot be explained by these factors.

In the current investigation, I hypothesized that these individual differences might be explained, at least in part, by personality variables. Regression results supported the notion that incorporating personality variables (extraversion and neuroticism) into a model of adjustment to MS-related stress increased the predictive utility of the model, above and beyond the effects of illness variables, cognitive appraisals, coping strategies, and social support. This indicates that individual differences in each MS patient’s level of extraversion and neuroticism proved useful in predicting the patient’s psychological adjustment.
Furthermore, incorporating personality factors into structural equation models in the present study improved model fit. Each of the models which included extraversion and neuroticism demonstrated better explanatory utility than the corresponding model which did not include personality variables. These findings suggest that a comprehensive model of coping with MS should include personality variables, in order to address individual differences which cannot be explained by previous models.

The current investigation has extended previous stress and coping research with MS patients by illustrating that incorporating personality variables into the model improves its predictive utility. Due to the non-experimental nature of the study, causal relationships cannot be determined. The nature of personality assessment compounds this issue. Because personality measures ask participants to rate their current disposition, and not their premorbid personality characteristics, we cannot conclude whether high levels of neuroticism and low levels of extraversion existed before the onset of MS. Regardless of the causal relationships between personality, MS, and adjustment, the importance of incorporating personality variables into models of adaptation to MS in future research is clear.

Although the present study considered only extraversion and neuroticism, the literature suggests that a variety of other individual difference variables may affect adjustment to multiple sclerosis. For example, research suggests that high levels of resilience, hardiness, and optimism may positively affect MS patients’ coping abilities and effectiveness (Ehde & Bombardier, 2006; Fournier, de Ridder, & Bensing, 2002; Johnson, Lange, Tiersky, DeLuca, & Natelson, 2001; McReynolds et al., 1999).
Maintaining an internal locus on control may also have protective effects (Johnson et al., 2001). In order to obtain a more comprehensive assessment of the effect of personality on adjustment to MS-related stress, future researchers should consider a wider variety of personality variables in models of coping with MS.

Practitioners should also consider the importance of personality variables in explaining individual differences in coping with MS. While only a few studies have explored personality change among MS patients, previous research suggests that key personality variables can vary as a result of therapy (e.g., Langemayr & Schottes, 2000). In light of these findings, practitioners should explore ways to address personality variables in treatment with MS patients, in order to encourage the expression of personality characteristics which have been associated with positive adjustment outcomes in preliminary research.

5.3 Direct Effects versus Buffering Effects

Because research has historically examined stress and coping models without consideration of personality variables, I assessed the predictive utility of the traditional direct effects model (Figure S.1) and the traditional stress buffering model (Figure S.2) in the current investigation. The traditional stress buffering model yielded superior fit to the data, which indicates that the relationship between cognitive appraisals and adjustment is better explained by the buffering effects of coping than by a direct relationship between the two.
Consistent with the hypothesis that coping buffers the effects of cognitive appraisals on adjustment, these data suggest that cognitive appraisals predict coping choice (i.e., which coping strategies are used) and coping effectiveness (i.e., how effective coping strategies are). MS patients who perceived that their coping ability exceeded the demands of the stressful situation, thereby utilizing challenge appraisals, tended to use more adaptive coping mechanisms. Participants who believed that the demands of the stressful situation exceeded their coping ability, thereby utilizing harm or threat appraisals, tended to utilize fewer adaptive coping strategies.

Not only did cognitive appraisals predict MS patients’ choice of coping strategy, but these appraisals also added to the prediction of coping effectiveness. The strength of the relationship between coping and adjustment increased markedly from the traditional direct effects model (Figure S.1) to the traditional stress buffering model (Figure S.2), indicating that cognitive appraisals predict the extent to which various coping strategies are associated with positive adjustment. This suggests that increased reliance on challenge appraisals and decreased use of harm/threat appraisals predict increases in coping effectiveness. These positive effects of challenge appraisals and negative effects of harm/threat appraisals were consistent with hypotheses and with the literature.

Evidence for the buffering effect of coping on cognitive appraisals lends support to the stress buffering hypothesis and suggests that researchers should consider the buffering effects of coping when constructing models of adjustment to MS. These findings support the notion that practitioners should not only teach effective coping
strategies to MS patients, but they should also concentrate on changing cognitive appraisals that may influence patients’ coping effectiveness.

Since the incorporation of personality variables consistently improved the predictive utility of stress and coping models, I assessed the relative fit of the direct effects and stress buffering effects models which included personality variables. Consistent with the traditional models, the personality stress buffering model (Figure S.4) yielded superior fit to personality direct effects model (Figure S.3). This indicates that relationships between adjustment and cognitive appraisals, extraversion, or neuroticism are better explained by the buffering effects of coping than by direct relationships between these variables and adjustment.

In accordance with hypotheses and results from the traditional models, findings suggest that coping buffers the effects of cognitive appraisals on adjustment by predicting coping choice and coping effectiveness. The superior fit of the personality stress buffering model suggests that coping also buffers the effects of extraversion and neuroticism on adjustment. MS patients with high levels of extraversion were more likely to utilize adaptive coping strategies, while those with high levels of neuroticism used fewer adaptive coping strategies. This indicates that assessment of personality variables can be used to predict MS patient’s choice of coping strategy.

In addition to the association between personality and coping strategy, results indicate that extraversion and neuroticism contribute to the prediction of coping effectiveness. The strength of the relationship between coping and adjustment increased markedly from the personality direct effects model (Figure S.3) to the personality stress
buffering model (Figure S.4). This indicates that cognitive appraisals, extraversion, and neuroticism predict the extent to which various coping strategies are associated with positive adjustment. It can be concluded that increased levels of extraversion and decreased levels of neuroticism are associated with increased coping effectiveness. This evidence for the buffering effect of coping on personality is consistent with hypotheses and with the literature.

Evidence for the buffering effect of coping on cognitive appraisals and personality variables provides additional support for the utility of the stress buffering hypothesis in explaining adjustment among MS patients. Future researchers should incorporate the buffering effect of coping when considering the role of personality in adjustment to MS. Practitioners should also remain cognizant of the buffering role of coping and target interventions to address coping, cognition, and the expression of personality traits.

Despite the aforementioned evidence for the buffering hypothesis, results of the personality direct effects model (Figure S.3) suggest that high levels of neuroticism directly predict negative adjustment outcomes, independent of the effects of social support, cognitive appraisals, or coping. MS patients who indicated high levels of neuroticism were more likely to indicate high levels of depression and anxiety, regardless of which cognitive and behavioral strategies they used. Although the majority of the results indicate that coping has a considerable buffering effect on personality and cognitive appraisals, researchers should also consider the direct effects of certain personality variables, such as neuroticism.
5.4 Incorporating Direct and Buffering Effects

In response to these findings, I specified a model which incorporated a mix of direct and buffering effects between extraversion, neuroticism, cognitive appraisals, social support, and adjustment. Because the original data set was utilized for model modification, specification of the personality mixed effects model (Figure S.11) should be considered exploratory, and not confirmatory, in nature. Therefore, the results of this model must be interpreted with caution.

The personality mixed effects model demonstrated superior fit to all other models considered in the current investigation. Removal of the buffering effect of coping on neuroticism and inclusion of a direct relationship between neuroticism and adjustment produced marked improvement in fit. This suggests that a considerable amount of the buffering effect of coping can be explained by the direct relationship between neuroticism and adjustment. Consequently, it can be concluded that high levels of neuroticism are associated with poor adjustment outcomes (e.g., increased depression, increased anxiety, and decreased mental health), regardless of the coping strategy used.

This finding has critical implications for psychological practice and behavioral medicine. This suggests that interventions which teach effective coping strategies may not be effective with MS patients who demonstrate high levels of neuroticism. The strength of the direct relationship between neuroticism and adjustment indicates that those with high levels of neuroticism will experience negative outcomes, regardless of the use of effective coping strategies. While it is important to note that this finding is exploratory, and therefore should be replicated in an independent population, further
exploration of this result is critical due to its implication that current psychosocial treatments may not be effective with a substantial portion of MS patients (i.e., those who are high in neuroticism).

Since previous MS researchers have not incorporated neuroticism into models of adjustment, I did not anticipate the strong direct effect of neuroticism on adjustment. Because the inverse relationship between neuroticism and outcome was so strong in this exploratory analysis, future researchers should include the direct effects of neuroticism and other personality variables on outcomes when specifying models of adjustment to MS.

In addition to the direct effects of neuroticism on adjustment, high levels of neuroticism were associated with decreased use of productive cognitive appraisals (e.g., challenge appraisals) and increased use of harmful cognitive appraisals (e.g., harm and threat appraisals). MS patients who indicated high levels of neuroticism (i.e. anxiety, tension, instability, worry) were more likely to view their resources as insufficient to cope with MS-related problems, thereby utilizing harmful appraisals. This finding further supports the notion that neuroticism is associated with negative adjustment outcomes among MS patients. Due to the high prevalence of neuroticism among MS patients, confirmation of the effects of neuroticism in this population is critical (Gatten et al., 1993; Johnson et al., 1996). Upcoming studies should seek to confirm the negative effects of neuroticism on adjustment which were demonstrated in this investigation.

While the personality mixed effect model suggests that neuroticism is related to adjustment regardless of coping strategy, the model concurs with aforementioned models
that coping buffers the effect of cognitive appraisals on adjustment, thereby affecting both coping choice and coping effectiveness. Analysis yielded evidence for a strong inverse relationship between reliance on harm/threat appraisals and use of adaptive coping strategies, suggesting that cognitive appraisals predict MS patients’ choice of coping strategy. Furthermore, cognitive appraisals added to the prediction of coping effectiveness. The strength of the relationship between coping and adjustment increased markedly from the traditional direct effects model (Figure S.1) to the mixed effects model (Figure S.11), indicating that cognitive appraisals predict the extent to which various coping strategies are associated with positive adjustment. This suggests that increased reliance on challenge appraisals and decreased use of harm/threat appraisals predict increased effectiveness.

The persistence of the buffering effect of coping on cognitive appraisals in the best fitting model (Figure S.11) lends support to the stress buffering hypothesis for cognitive appraisals. These findings further support the notion that researchers should consider the buffering effects of coping on cognitive appraisals when constructing models of adjustment to MS. These findings also suggest that MS patients may benefit from treatment interventions which target reliance on cognitive appraisals which are associated with increased coping effectiveness.

In addition to the buffering effect of coping on cognitive appraisals, the personality mixed effects model suggests that coping moderately buffers the effects of extraversion on adjustment. Results were consistent with hypotheses that extraversion may influence adjustment by affecting which coping strategies are used by MS patients.
MS patients in the current investigation who indicated high levels of extraversion were more likely to utilize adaptive coping strategies. Patients who used adaptive coping strategies were more likely to experience positive adjustment. While it cannot be concluded that extraversion causes changes in coping choice or effectiveness, evidence indicates that high levels of extraversion are associated with superior coping choice and outcome.

This suggests that MS patients who are more outgoing, talkative, and assertive are more likely to utilize adaptive coping strategies, and therefore, to experience positive outcomes (e.g., high mental health, low depression and anxiety). These findings imply that supportive interventions, which are encouraged by organizations which provide services to MS patients, may positively affect adjustment by encouraging the expression of extraverted traits (National Multiple Sclerosis Society, June 2005). Particularly considering the low levels of extraversion reported in the MS population (Gatten et al., 1993), practitioners should continue to encourage MS patients to seek interpersonal interactions which may positively affect their tendency to express extraversion. Future research should explore interventions which increase affect extraversion in this population.

This research contributes to practice by providing support for the rationale behind supportive interventions. Furthermore, this study contributes to existing research by demonstrating the necessity to consider personality variables as explanations for individual differences in adjustment to MS. As mentioned previously, researchers should
consider extraversion and other personality variables in comprehensive models of MS which are tested in the future.

Lastly, in addition to the buffering effects of coping, results of the current investigation support hypotheses that social support buffers the effects of personality variables on adjustment. Both neuroticism and extraversion were associated with MS patient’s perception of the availability of social support, the frequency with which they utilize social support, and their perceptions about how useful social support is to them. These aspects of social support were predictive of positive psychological adjustment.

In the current investigation, high levels of neuroticism were associated with perceptions of low availability, frequency, and usefulness of social support. By definition, individuals who score high on neuroticism tend to experience anxiety, tension, instability, worry, self-defeating thoughts, self-consciousness, and hostility (McCrae & John, 1992). Given these dispositional attributes, it can be expected that highly neurotic individuals may have interpersonal difficulties, and therefore, experience lower levels of social support. Conversely, high levels of extraversion were associated with high social support ratings; including high availability, frequency, and usefulness of social support. Individuals who score high on extraversion tend to be outgoing, positive, assertive, enthusiastic, and talkative (McCrae & John, 1992). It can be expected that individuals with these attributes might invite more interpersonal relationships, and therefore, experience higher levels of social support.

The current investigation concurs with the literature that social support directly affects adjustment; such that high levels of social support among MS patients are
predictive of positive adjustment outcomes. These findings lend support to the buffering hypothesis that neuroticism and extraversion affect adjustment indirectly by influencing the social support received by MS patients. Individuals with different personalities seem to attract different amounts of support from their social environment, and research suggests that this support is protective against negative adjustment outcomes.

These findings suggest that practitioners can positively affect adjustment among MS patients by influencing the levels of neuroticism and extraversion demonstrated by these individuals. Practitioners should promote stress-reduction techniques and cognitive-behavioral therapy, which may decrease neuroticism (e.g., anxiety, tension, instability, worry, and self-defeating thoughts) in MS patients (Foley & Sarnoff, 2003). Practitioners should also continue to promote supportive interventions, such as self help groups and peer support, to encourage the expression of extraversion in MS patients (National Multiple Sclerosis Society, June 2005).

Due to the high levels of neuroticism and low levels of extraversion reported by MS patients (Gatten et al., 1993), exploring the effects of these variables is particularly important in this population. Researchers should investigate interventions which reduce neuroticism and increase extraversion in MS patients. In testing comprehensive models of adjustment to MS, future researchers should consider the effects of neuroticism and extraversion, as well as other personality variables.

Overall, the results of the personality direct effects model (Figure S.11) suggest that a comprehensive model of adjustment to MS should include coping, cognitive appraisals, social support, extraversion, and neuroticism. Furthermore, any complete
model should also incorporate a combination of direct and buffering effects. Because one data set was utilized in the current investigation to test hypothesized models and to create a new model, these analyses should be considered exploratory, and not confirmatory, in nature. Therefore, interpretations following from the results of this analysis must be confirmed in independent samples in order to validate their accuracy and utility.

5.5 Implications for Research & Practice

The current investigation contributes to the study of stress and coping by comparing the two prevailing models in the literature, the direct effects model and the stress buffering model. Similar to previous research, the present study provides some support for each of the models. Because both models seem to contribute to the explanation of adjustment to stress, research focused on pitting the models against one another may be futile. It is concluded that a comprehensive model of coping with stress should incorporate both direct and stress buffering effects.

Particularly given the scarcity of MS research which is driven by psychological theory, the current investigation advances the study of MS by providing support for the potential of a stress and coping model to explain adaptation to MS. Results of the present study contribute to our understanding of coping with MS by incorporating personality variables into previously hypothesized models. Heretofore, stress and coping models have conceptualized adjustment to chronic stress as a uniform process, suggesting that cognitive and behavioral variables should affect individuals similarly. The current
investigation suggests that stress and coping researchers must attend to individual
differences in the adjustment process.

Despite the apparent need for exploration of coping among MS patients, a limited
number of studies have examined the unique pattern of coping in this population. The
lack of adequate measurement instruments for assessment of MS patients likely
contributes to the scarcity of research in this area. The present study contributes to MS
research by providing support for the utility and factor structure of the Coping with
Multiple Sclerosis Scale (CMSS: Pakenham, 2001), a scale which assesses the use of
specific strategies for coping with multiple sclerosis. Although previous MS researchers
have relied on coping scales developed for the general population, many agree that
general coping scales do not include the diversity of strategies used to cope with multiple
sclerosis (Maes et al., 1996; Pakenham, 2001). For this reason, it is recommended that
researchers validate and utilize instruments which are specifically designed for MS
patients. The development of MS-specific instruments will not only advance MS
research, but it will also prove valuable to practitioners by enabling them to obtain more
accurate assessments of MS patients.

While a lack of appropriate instruments may contribute to the limited amount of
psychological research with MS patients, studies investigating adjustment in this
population have consistently found that adjustment outcomes are more related to
cognitive and behavioral factors than to physical disability or disease progression.
Although causation cannot be concluded from this study, the clear relationship between
coping behavior and adjustment in the current investigation suggests that altering the
coping style of MS patients’ might affect their adjustment. Therefore, it is anticipated that coping skills training may prove effective in improving adjustment outcomes in this population. This recommendation is supported by previous research, which found that teaching effective coping strategies to MS patients improves psychological outcomes (e.g., Schwartz, 1999).

Despite evidence for the effectiveness of coping skills training with the MS population, the majority of resources available to patients through the National Multiple Sclerosis Society (NMSS) focus on education and social support (NMSS, June 2005). This organization is likely providing a disservice to MS patients by neglecting to offer interventions which research suggests may be the more effective in improving outcome in MS patients. It is suggested that practitioners and organizations which provide services to MS patients should teach coping strategies which are closely related to positive adjustment outcomes. Further research is needed to replicate Schwartz’s (1999) finding that coping skills training is effective with MS patients.

In addition to the link between coping and adjustment, the present study provided evidence that cognitive appraisals are related to MS patients’ psychological adjustment. The strong association between cognitive factors and adjustment suggests that treatment providers should be able to improve psychological adjustment among MS patients by encouraging the adoption of adaptive cognitions. Despite recent evidence that cognitive-behavioral therapy (CBT) with MS patients can yield significant improvements over supportive therapy (Mohr et al., 2005), NMSS continues to focus resources on relaxation and support as solutions for emotional problems in MS patients (NMSS, January 2006).
NMSS should update recommendations for dealing with the emotional effects of MS to include information about the appropriateness and efficacy of CBT with this population.

In the treatment of MS patients, practitioners should consider the effects of cognitive factors and comprehensively assess the patient’s perceptions about disease-related stress (i.e., cognitive appraisals). Practitioners should utilize existing research about cognitive factors to inform treatment of MS patients from a cognitive perspective. Furthermore, researchers should conduct experimental research to replicate Mohr et al.’s (2005) finding that cognitive interventions cause significant improvements in psychological outcomes in MS patients.

While several researchers have examined stress and coping among MS patients, none have incorporated personality factors into a comprehensive model of adjustment to MS. Correlation, regression, and structural equation modeling results from the present study provided concurrent support for the notion that personality variables affect the stress and coping model of MS, and therefore, should be considered in future examinations of this phenomenon. Although the only personality variables considered in the current investigation were extraversion and neuroticism, previous research suggests that a variety of other individual difference variables may affect adjustment to multiple sclerosis; including resilience, hardiness, optimism, and locus of control (Ehde & Bombardier, 2006; Fournier et al., 2002; Johnson et al., 2001; McReynolds et al., 1999). Because research indicates that numerous aspects of personality likely affect coping and adjustment among MS patients, future studies should consider a wide variety of personality variables in models of coping with MS.
Exploration of the mechanisms by which personality affects adjustment will also inform the work of practitioners. Although personality change has not been explored by many researchers, some studies suggest that personality variables can vary as a result of therapy (e.g., Langemayr & Schottes, 2000). Once researchers shed light on the relationships between personality and adjustment to MS, practitioners can utilize these findings to develop new therapies to encourage the expression of personality characteristics which are associated with positive adjustment outcomes in this population.

5.6 Measurement Issues

The assessment methods used in the present study have several unique strengths and limitations. The decision to collect data via online administration of instruments posed both benefits and drawbacks. Recruiting participants online enabled me to reach a large number of MS patients in an efficient and economical manner. Advertisement via electronic mail and online message boards facilitated the recruitment of a diverse sample of MS patients. The geographic and economic diversity of the sample contributed to the fact that the sample was representative of the MS population.

Despite these advantages, online data collection likely biased the sample in other ways (e.g., only reaching participants with access to the internet, excluding patients who were too disabled to complete an online survey). Most importantly, web-based data collection prevented the acquisition of medical confirmation of each participant’s diagnosis, MS type, or symptoms. Because the present study relied on patient reports of specific test results to confirm that they had received a formal diagnosis of MS, I cannot
be certain that all participants were diagnosed with MS. However, since no incentives were offered for participation, I expect that malingerers likely did not complete the entire 30-minute questionnaire; and therefore, it can be expected that fraudulent participants were excluded from analyses.

While some researchers remain concerned about the reliability and validity of online data collection, statistical properties of the instruments in the current investigation were comparable to previous administrations, suggesting that these concerns are unnecessary. The current findings concur with previous research that online administration of health-related assessments do not yield significantly different results than paper-and-pencil versions (Ritter, Lorig, Laurent, & Matthews, 2004). Therefore, I concluded that the benefits of online data collection outweighed the potential limitations in the current study. Ideally, researchers should obtain physician’s assessments of the health status of each participant in MS research. However, because this is not always feasible, online administration is a reasonable option.

Because participants completed questionnaires online, the results of this investigation are all based on self-report data. Some researchers have questioned the reliability and validity of patients’ subjective reports of health-related symptoms (Costa & McCrae, 1985; Watson & Pennebaker, 1989). Given data suggesting that subjective reports of symptoms may be biased, it is important to employ measures to assure the unbiased assessment of each participant’s physical disability. Obtaining a physician’s disability assessment for each participant would have added to the validity of disability
measurements in the current investigation. Future researchers should acquire physician’s assessments for each MS patient whenever possible.

Since obtaining physician assessments of disability was not feasible, the present study utilized the Self Administered Expanded Disability Status Scale (EDSS-S; Bowen et al., 2001) to assess physical disability. Likely because the EDSS-S asks objective questions about specific aspects of physical functioning, previous researchers have found that the EDSS-S is highly consistent with the physician-administered scale (Bowen et al., 2001). Therefore, it can be expected that self-report bias did not significantly affect measurement of physical disability in the current investigation. Although obtaining a physician’s disability assessment for each participant is ideal, research suggests that utilizing the EDSS-S is a reasonable alternative.

While some bias most likely exists in subjectively reported data, I argue that self-report instruments were appropriate for the current investigation because a patient’s subjective experience is more important to his or her psychological adjustment than any objectively determined criteria. Even if two patients experience an objectively identical disease course, one patient might perceive his or her symptoms as controllable and experience positive adjustment, while the other patient may feel that his MS is uncontrollable and suffer from depression. Therefore, it is the patient’s perception of his situation, and not the objectively assessed situation, which impacts his psychological adjustment. For this reason, I was more concerned with assessing MS patient’s perception of controllability, health status, and psychological outcomes than with measuring objective determinations of these variables.
Although many theorists argue that MS research should utilize instruments which are specifically developed for MS patients, few investigations utilize disease specific instruments. The current investigation utilized scales developed for illness populations (e.g. CES-D and BAI-PC) to avoid overlap between physical symptoms of MS and those of mood and anxiety disorders. Because no published scales exist for assessing most psychological outcomes (e.g., depression, anxiety, life satisfaction) with MS patients, it is recommended that future research focus on development of instruments which differentiate MS symptoms from the physical effects of psychological disorders.

The present study contributes to MS research by assessing the utility of a MS-specific coping measure, the Coping with Multiple Sclerosis Scale (CMSS; Pakenham, 2001). The failure of the majority of CMSS subscales to fit into the measurement model indicates that the CMSS is likely not the optimal instrument for assessing the role of coping in a model of adjustment to MS-related stress. The fact that only a minority of CMSS subscales were included in the analysis likely resulted in measurement limitations; including, decreased instrument reliability and exclusion of critical coping variables. The flawed measurement of coping in the current investigation may have adversely affected the relationships between coping and other variables in the adjustment model. Future researchers should include a variety of coping measures in order to minimize the adverse effects of unproven scales.

Despite the incompatibility between the measurement model and CMSS subscales, the current investigation provided support for the conceptual structure of the CMSS, indicating the assessment of seven distinct coping strategies. Even though the
CMSS demonstrated low to moderate reliabilities in comparison to established coping scales, it is important to note that the CMSS remains the only published MS-specific coping scale. Therefore, it is suggested that researchers refine the CMSS to improve its reliability with the MS population or develop an independent measure of coping with MS-related stressors which yields superior psychometric properties. Despite the difficulties establishing and validating scales for MS patients, it is recommended that future researchers utilize MS-specific scales due to their improved validity with this population. However, researchers should remain cognizant of the suboptimal psychometric properties of these scales until significant improvements can be made.

5.7 Internal & External Validity

In an effort to conduct an objective investigation of a naturally occurring phenomenon, I selected research methodology which achieved a compromise between optimal levels of internal and external validity. The uncontrollable nature of disease course and illness-related variables in MS patients prevented the manipulation of these variables. Consequently, I chose to assess behavior, cognition, and adjustment within the naturally occurring disease course of MS, thereby avoiding any artificial manipulation of variables. For this reason, we cannot render causal conclusions about the relationships between variables in the model.

While the results of the present investigation provide support for certain causal relationships, we must consider alternate plausible explanations, such as reverse causation. Results provide support for the hypothesis that reliance on adaptive coping
strategies reduces depression and anxiety in MS patients. However, it is also possible that low levels of depression and anxiety cause MS patients to utilize more adaptive coping. Therefore, readers should attend to the importance of the relationships between variables, as well as the implications that these relationships have for future research and treatment with MS patients. Implications for treatments which may cause improvements in psychosocial adjustment among MS patients must be experimentally tested in order to establish causal effectiveness.

Although the directionality of causal relationships cannot be proven, the statistical methodology in the present study provided support for hypothesized causal relationships. Even though analyses to eliminate measurement error from the model were conducted, measurement error likely contributed to the failure of hypothesized models to yield acceptable fit indices with this sample. Because the traditional direct effects model (Figure S.1) and traditional stress buffering model (Figure S.2) demonstrated acceptable fit in previous studies, it is expected that measurement error contributed to the resulting lack of fit in the current investigation.

The heterogeneity of the MS population may also have been a factor in the poor fit of the models. Due to the highly variable disease course and the wide variety of symptoms experienced by MS patients, conceptualizing the MS population as a homogeneous group may be unwarranted. The incredible variability among MS patients renders the inclusion of individual difference variables critical in developing a comprehensive model of adjustment to MS. Future research should investigate the utility
of a wide variety of individual difference variables in models of adjustment with this population.

While the non-experimental nature of the study compromised the ability to render causal conclusions, I maintain that assessing uncontrolled variables was the optimal method for investigating the naturally occurring effects of MS. In an effort to optimize the representativeness of the sample, the methodology imposed certain limitations to external validity. Recruiting participants via online solicitations enabled the inclusion of a representative sample of MS patients in the study. However, this recruitment method resulted in a nonrandom sample, which limits the generalizability of the findings. Because the majority of participants were solicited via peer support message boards, it can be expected that a particular subgroup of MS patients (e.g., those who seek support online) comprised the current sample. Therefore, application of the results to the entire population of MS patients should be considered with caution.

Although the sample was representative of the MS population, the lack of racial and ethnic diversity among participants prevented comparisons based on these variables. Because MS occurs much more frequently in Caucasians than in any minority group, many researchers have difficulty obtaining racially diverse samples (Kalb, 2003). Despite these difficulties, research exploring racial differences in adjustment to MS is needed. Therefore, it is suggested that researchers focus recruitment on MS patients of color to allow for racial and ethnic comparisons in future research.

Lastly, the use of the Coping with Multiple Sclerosis Scale (CMSS: Pakenham, 2001) limits the generalizability of these results to other operationalizations of coping.
Even though the findings of the current investigation coincide with the majority of the MS literature, the use of a disease-specific coping measure denotes that the current findings may not apply to models which utilize a different conceptualization of coping. I argue that the results of the current investigation are more pertinent to the MS population than those generated utilizing general measures of coping, because these findings were generated using a MS-specific measure of coping. Therefore, the present findings are arguably more applicable to the MS population.

5.8 Future Directions

The findings of the current investigation suggest a host of implications for future research. Because this study provided support for direct and stress buffering effects, research focused on pitting the models against one another may be futile. Consequently, it is recommended that future researchers develop models of coping with MS-related stress which incorporate both direct and stress buffering effects. The current study advances the MS literature by illustrating the importance of including personality variables into the investigation of stress and coping with MS. In testing comprehensive models of adjustment to MS-related stress, future researchers should consider a broad array of personality variables (including, extraversion, neuroticism, resilience, hardiness, optimism, and locus of control) in models of coping with MS.

MS research will also be enhanced by the development of MS-specific coping measures to increase the validity of psychological assessment with this population. Researchers should work to develop a measure of coping with MS-related stressors which
yields superior psychometric properties to the scale used in the present study. It is also suggested that researchers develop reliable outcomes instruments (e.g., depression, anxiety) that are specifically designed for MS patients. Due to the improved validity of disease specific scales with this population, it is recommended that researchers utilize MS-specific scales in future studies. However, researchers should remain cognizant of the suboptimal psychometric properties of these scales until more reliable MS-specific scales are developed.

The high incidence of emotional disorders among MS patients illustrates the tremendous need for psychological treatment in this population (Rao et al., 1992). Particularly because no psychosocial intervention has been developed to specifically target MS patients, practitioners must utilize research to develop effective interventions for this population. The association between extraversion and positive outcomes suggests that the supportive interventions, which are currently being encouraged by national MS organizations, may increase psychological adjustment among MS patients. Particularly due to the prevalence of supportive services provided to MS patients, researchers should conduct controlled research to assess whether these supportive interventions cause positive outcomes.

Findings imply that many MS patients would likely benefit from treatment interventions which target the use of effective coping strategies. Despite some controlled research indicating that coping skills training is effective with MS patients (Schwatz 1999), coping interventions have received little attention in the MS literature. Future research is needed to confirm the positive effects of coping skills training with MS.
patients. Since findings suggest that neuroticism may influence the efficacy of coping skills training, future researchers should explore the effect of coping skills interventions with different subsets of MS patients, based on personality variables.

The conclusion that the psychological adjustment of MS patients is more related to cognitive and behavioral factors than to the unpredictable physical effects of the disease suggests that cognitive-behavioral therapy (CBT) may prove effective with this population. Particularly because CBT is not recognized by national MS organizations as a recommended treatment for MS, researchers should conduct experimental research to determine whether cognitive-behavioral interventions cause significant improvements in psychological outcomes in MS patients.

While further research is suggested to validate the effectiveness of various treatments with MS patients, the current investigation offers implications which can inform current psychological practice with this population. Practitioners should remain cognizant of the research support for strong relationships between cognitive appraisals, coping, and adjustment among MS patients. In light of this research, practitioners should employ interventions aimed at encouraging the use of adaptive coping strategies. They should also utilize existing research about cognitive factors to inform treatment of MS patients from a cognitive perspective. Organizations which provide services to MS patients should teach coping strategies and cognitive styles which are closely related to positive adjustment outcomes.

Even though research support for the relationship between personality and adjustment to MS is less conclusive, practitioners can utilize preliminary research to
familiarize themselves with personality variables which may affect psychological outcomes in MS patients. Once researchers shed more light on the relationships between personality and adjustment to MS, practitioners can utilize these findings to develop new therapies to encourage the expression of personality characteristics which are associated with positive adjustment outcomes in this population.

Although many questions remained unanswered about the process of effectively coping with the MS-related stress, the current investigation contributes to research and practice with MS patients by providing support for relationships between cognitive-behavioral factors and psychological adjustment in this population. This study advances the MS literature by illustrating the vital role of personality in explaining individual differences in adjustment to MS. The wide range of emotional consequences experienced by MS patients renders the issue of effective adjustment particularly critical for this population. In order to develop effective psychological interventions for MS patients, researchers must strive to attain a full understanding of the relationships between coping, appraisals, social support, and individual difference variables. The current investigation contributes to the psychological adjustment of MS patients by suggesting promising areas for treatment and continued research with the MS population.
APPENDIX A

Posting for list serves and message boards

My name is Holly Chalk. Ever since I was diagnosed with MS at the age of 21, I have learned that coping with this disease can be extremely challenging. As part of my dissertation research, I am studying the process of coping with MS in order to establish more effective ways of dealing with the uncertainty of this diagnosis.

I am deeply invested in the fight to improve the quality of life for individuals who have been diagnosed with MS. If you have been diagnosed with MS, I would appreciate hearing your perspective. If you would be willing to offer your input, please contact me at chalk.12@osu.edu.
Solicitation e-mail

Dear MS patient,

My name is Holly M. Chalk, and I am currently a graduate student in the department of Psychology at the Ohio State University. My advisor at OSU is Dr. Don M. Dell. I am conducting a study about coping with multiple sclerosis, from initial diagnosis to subsequent exacerbations.

Ever since I was diagnosed with MS at the age of 21, I have been interested in the emotional and psychological effects of MS. I know from personal experience that coping with the initial diagnosis of MS, as well as coping with subsequent exacerbations and life changes, can be extremely challenging. I hope to explore coping with MS, in order to establish more effective ways of dealing with the uncertainty of this diagnosis.

If you have been diagnosed with MS, I invite you to participate in this study. Your participation would entail filling out various questionnaires online. The time you might spend on this study would be between 30-40 minutes. Your participation will allow us to gain more information about successful ways to cope with multiple sclerosis.

I am deeply invested in the fight to improve the quality of life for individuals who have been diagnosed with MS. If you or someone close to you suffers from MS, I’m sure that you share my interest in finding ways to live a happy life with MS. I would truly appreciate your participation in this study. The results of this study will be posted on http://msresearch.dyndns.org when data collection and analysis are completed.

Please understand that all the information you provide in this study will be kept confidential, and no identifying information will be requested from you. In order to participate in my study, please follow the link below. Thank you for your time and commitment to MS research. Please let me know if you have any questions or concerns.

http://msresearch.dyndns.org

Sincerely,

Holly M. Chalk, M.A.     Don M. Dell, Ph. D.
Doctoral Candidate     Advisor
Counseling Psychology Program    Associate Professor
Department of Psychology    Department of Psychology
The Ohio State University    The Ohio State University
APPENDIX C

Introductory webpage

Dear potential participant,

My name is Holly M. Chalk, and I am currently a graduate student in the department of Psychology at the Ohio State University. My adviser at OSU is Dr. Don M. Dell. I am conducting a study about coping with multiple sclerosis, from initial diagnosis to subsequent exacerbations.

Ever since I was diagnosed with MS at the age of 21, I have been interested in the emotional and psychological effects of MS. I know from personal experience that coping with the initial diagnosis of MS, as well as coping with subsequent exacerbations and life changes, can be extremely challenging. I hope to explore coping with MS, in order to establish more effective ways of dealing with the uncertainty of this diagnosis.

If you have been diagnosed with MS, I invite you to participate in this study. Your participation would entail filling out various questionnaires online. The time you might spend on this study would be between 30-40 minutes. Your participation will allow us to gain more information about successful ways to cope with multiple sclerosis.

I am deeply invested in the fight to improve the quality of life for individuals who have been diagnosed with MS. If you or someone close to you suffers from MS, I’m sure that you share my interest in findings ways to live a happy life with MS. I would truly appreciate your participation in this study. The results of this study will be posted on http://msresearch.dyndns.org when data collection and analysis are completed.

Participation is voluntary and you may withdraw at any time by closing your web browser. If you decide that you would like your responses deleted from the study, you will have the opportunity to do so. The information you provide will be kept confidential by researchers. There is a possibility, although remote, that your IP address could be identified or that you responses could be intercepted during transmission. However, your numerical responses won’t be linked to questions, and therefore, will not be meaningful.

In order to participate in my study, please follow the link below. Please let me know if you have any questions or concerns. Thank you for your time and commitment to MS research. http://msresearch.dyndns.org

Sincerely,

Holly M. Chalk, M.A.  Don M. Dell, Ph. D.
Counseling Psychology Program  Associate Professor
Department of Psychology  Department of Psychology
The Ohio State University  The Ohio State University
APPENDIX D

Informed consent page

By clicking “Yes” below, I indicate that I understand the procedures involved in this study.

I am aware that I have the right to ask questions and receive answers related to this study by contacting the investigators, Dr. Don Dell, dell.1@osu.edu, (614) 688-8287; Holly Chalk, chalk.12@osu.edu. Furthermore, if I have questions about my rights as a research participant, I can call the Office of Research Risks Protection at Ohio State University at (614)688-4792.

I am aware that I have the right to refuse to participate and may withdraw at any time without any penalty, simple by closing my web browser. Furthermore, I do not have to answer any question that I do not wish to answer and can merely skip questions. I understand that my participation is completely voluntary.

To indicate your consent to participate in this study, please select “Yes” below. Making that selection will act as your signature on this form.

_____ Yes, I give my consent to participate in this study.

_____ No, I do not give my consent to participate in this study.

I certify that I am at least 18 years of age.

_____ Yes, I am at least 18 years of age.

_____ No, I am under the age of 18.
Completion of study page

Thank you for your participation. This study is intended to explore the usefulness of different ways that people cope with multiple sclerosis. We hypothesize that the manner in which patients cope with MS exacerbations affects their overall adjustment and life satisfaction. We expect that personality variables may affect the relationship between coping and adjustment.

If in the course of this study you have developed concerns or uncertainties about your feelings, or if you feel any type of distress related to your responses, you may wish to seek counseling. Please visit http://www.nmss.org/ and enter your zip code to find your local National MS Society chapter. Each chapter offers a variety of group or individual counseling services. If you have any other questions about this study or would like additional counseling referrals, please contact Dr. Don Dell at dell.1@osu.edu or (614) 688-8287 or Holly Chalk, M.A. at chalk.12@osu.edu. If you have any concerns about the way that this study was conducted, please contact the Office of Responsible Research Practices at Ohio State University at (614) 688-8457.

We would appreciate your help in reaching more MS patients. If you know any other people affected by Multiple Sclerosis and would like to send them an email invitation to participate, please click HERE. Again, this email will be sent using your own email address and will not be held by us for any purposes. Simply address the email and click “Send”.

Again, thank you for assisting us with this research. We hope that the findings from this study will be used to benefit other individuals who cope with MS. If you wish to know more about the outcomes of this study, please return to this webpage (http://msresearch.dyndns.org) in July 2006 to view the results or contact chalk.12@osu.edu for more information. Thank you.
APPENDIX F

Demographic Questionnaire

Instructions: Please respond to the following questions. DO NOT PROVIDE YOUR NAME OR OTHER IDENTIFYING INFORMATION. Select the button corresponding to your answer to each item or write in a value for that item, when appropriate.

1. Gender:     Male     Female

2. Age _____ (in years)

3. Race/Ethnicity
   American Indian or Alaska Native
   Asian or Pacific Islander
   African American/Black
   Caucasian/White
   Hispanic/Latino
   Other: _______________

4. Highest level of education completed
   Middle School     High School     Associate’s Degree/Certificate     Bachelor’s Degree     Graduate/Professional Degree

5. Household income
   Under $24,999     $25,000-$49,999     $50,000-74,999
   $75,000-99,999     $100,000 or more     Don’t know

6. Region of current residence
   North East (CT, DC, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT)
   South East (AL, FL, GA, NC, SC, TN, VA, Puerto Rico, US Virgin Islands)
   North Central (IA, IL, IN, KY, MI, MN, NE, OH, WI, WV)
   South Central (AR, KS, LA, MO, MS, NM, OK, TX)
   North West (AK, CO, ID, MT, ND, OR, SD, WA, WY)
   South West (AZ, CA, HI, NV, UT, Guam, Pacific Territories)
   Other: _______________
7. What is your marital status?

Single/ Never Married/Living Divorced/ Widowed
Married with Partner Separated

8. What is your employment status?

Employed Employed Home Retired Disability Unemployment Other
Full Time Part Time Duties benefits benefits

If other, please specify nature of employment: ____________________

9. Who is your primary caregiver?

Spouse or Son or Nurse/Health Other
Significant other Daughter Care Staff

If other, please specify relation to caregiver: _______________

10. Overall, how would you rate your current health status?

Very Poor Poor Fair Good Very Good Excellent

11. How old were you when you were diagnosed with MS?

Age in years __________ years

12. How long had you been experiencing symptoms when you were diagnosed?

_________ months and ________ years

13. Which of the following tests confirmed your diagnoses of MS? (select all that apply)

MRI (imaging technique) Spinal Tap Evoked Potentials Other

If other, please specify: ____________________
14. What type of MS have you been diagnosed with? If unsure, please read the descriptions below and select the type which most closely matches your disease course.

- **Relapsing-remitting MS:** characterized by unpredictable acute attacks, called "exacerbations," with worsening of symptoms followed by full or partial recovery of function. These attacks appear to evolve over several days to weeks. Recovery from an attack takes weeks sometimes months. The disease does not worsen in the periods between the attacks.
- **Primary progressive MS:** characterized by a gradual but steady progression of disability, without any obvious relapses and remissions.
- **Secondary progressive MS:** initially begins with a relapsing-remitting course, but later evolves into progressive disease. The progressive part of the disease may begin shortly after the onset of MS, or it may occur years or decades later.
- **Progressive relapsing MS:** This is the least common form of the disease and is characterized by a steady progression in disability with acute attacks that may or may not be followed by some recovery.

15. How many exacerbations have you experienced? _______

16. How long has it been since your last exacerbation?

_______ days ______ months ______ years

17. How often do you see a psychologist, clergyman, or counselor to aid in dealing with the emotional stress of your diagnosis?

<table>
<thead>
<tr>
<th></th>
<th>I never</th>
<th>Once a</th>
<th>Once a</th>
<th>Once a</th>
<th>I did in the past, but not anymore</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>did</td>
<td>week</td>
<td>month</td>
<td>year</td>
<td></td>
</tr>
</tbody>
</table>

18. Which of the following people prompted you to seek counseling?

- Physician
- Family
- Friend
- Myself
- Nobody
- Member

19. Do you have any other diagnoses? (Please check all that apply)

- Diabetes
- Alzheimer’s disease
- Parkinson’s disease
- Senile Dementia
- Stroke
- Heart Disease
- Other: (Please specify) _______________________

151
APPENDIX G

Self Administered Expanded Disability Status Scale (EDSS-S; Bowen et al., 2001).

When answering the following questions, please think about an average day for you (not a particularly good or bad day). Please answer each question regarding your BEST performance on a typical day. For each question, please select the button corresponding to your answer.

**Coordination:**

On an average day, at my best, my coordination:

<table>
<thead>
<tr>
<th></th>
<th>The same as before I had MS</th>
<th>Almost the same as before I had MS</th>
<th>Interferes with some movements, though I can eventually complete them without help</th>
<th>I must get help, use a mechanical device, or brace the limb to complete movements</th>
<th>Prevents me from completing movements even with help.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right arm</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Left arm</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Right leg</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Left leg</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

**Vision:**

1. I see double (two things, where there is really only one):
   □ Never    □ About once a week    □ Almost daily    □ Constantly

2. On an average day, my eye movements are unsteady
   □ Never    □ Only when looking to the side    □ All the time
Speech:
On an average day, my speech is:
☐ Is the same as before I had MS
☐ Slightly Slurred
☐ Moderately Slurred
☐ Severely Slurred

Swallowing:
On an average day, my swallowing is:
☐ Normal
☐ Occasional choking
☐ Unable to swallow

Thinking:
On an average day, my thinking and memory is:

**Although some people may wish to consider thinking and memory separately, we need you to combine them and check one box below.**

☐ Is the same as before I had MS
☐ Is almost the same as before I had MS
☐ Occasionally causes a problem in my daily life
☐ Frequently causes a problem in my daily life
☐ Others have to help me manage my affairs

Check **only** one box that best describes your MS disease activity over time

☐ Attacks (exacerbations, relapses) come on over a few hours or days, last from one day to several weeks, but once they are over, you feel the same as you always have.

continued on next page
Attacks (exacerbations, relapses) come on over a few hours or days, last from one day to several weeks. After some attacks, your symptoms are worse then before. The symptoms that remain after the attack are stable until a new attack occurs.

At the start of the disease, attacks (exacerbations, relapses) occur. You may feel your symptoms get worse because of these attacks. Then even between the attacks, you feel you are getting worse. In some cases, attacks cease, yet your symptoms continued to worsen.

Symptoms worsen from the beginning. Your symptoms may be stable for a time, gradually worsen, or deteriorate rapidly, but attacks (exacerbations, relapses) have never occurred.

Symptoms gradually worsen from the beginning. Your symptoms may be stable for a time at the beginning, or may deteriorate rapidly. Attacks (exacerbations, relapses) did not occur at the start, but may occur later in the course of the disease.
APPENDIX H

Coping with Multiple Sclerosis Scale (CMSS: Pakenham, 2001)

Most people with Multiple Sclerosis (MS) say that MS affects many areas of their lives and produces a variety of problems. For example, MS may cause financial problems, strain relationships, create emotional distress such as depression and, of course, physical problems such as limited mobility and the loss of control of some body functions. Below please describe the main MS-related problem you have experienced in the last month.

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

_____________________________________________________________________________________

Circle a number to rate how stressful this problem has been for you in the past month

<table>
<thead>
<tr>
<th>Not at all Stressful</th>
<th>Somewhat Stressful</th>
<th>Extremely Stressful</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

Individuals with MS have developed a number of ways to cope, or deal with the problems caused by MS. Sometimes our attempts are successful in helping us solve a problem or feel better, and other times they are not.
Below is a list of things that people have reported they may do when confronted with problems related to MS. Please indicate how often you have tried each of the coping strategies in dealing with your main MS-related problem (you identified above) in the past month. If you were unable to identify a “main problem” please indicate how often you have tried each of the coping strategies in dealing with your MS in general. There are no ‘right’ or “wrong” answers.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Doesn’t Apply/Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I use exercise programs such as hydrotherapy, physical exercise</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>I try to find comfort in my religion/faith.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>I go on as if nothing has happened</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>I avoid situations that may aggravate the problem</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>I have a rest</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>I ask for physical assistance</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>I conserve my energy, for example, by pacing myself or prioritizing activities</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>I modify my living environments to meet my needs, for example, make home modifications, install air conditioners.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>I keep pushing myself to get things done</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>I let my feelings out.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>I concentrate my efforts on things I can do</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>I focus on the here and now</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>I think about how I might best solve the problem</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doesn’t Apply/ Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Very often</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>----------------------</td>
<td>--------</td>
<td>-----------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>14</td>
<td>I talk to someone about how I feel.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>I seek alternative therapies such as acupuncture, chiropractics, osteopathy.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>I keep others from knowing my problems.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>I use relaxation techniques such as meditation, visualization, yoga, massage.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>I laugh and try to find humor in my situation.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>I think of others worse off than me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>I accept the fact that it happened.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td>I control my emotions.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>22</td>
<td>I try to get something positive out of it</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>23</td>
<td>I plan ahead what I need to do.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>24</td>
<td>I put it to the back of my mind and try not to think about it.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>25</td>
<td>I blame MS</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>26</td>
<td>I use assistive equipment such as a wheelchair, computer, crutches or incontinence aids.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>27</td>
<td>I use respite services</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>28</td>
<td>I ask for financial or other material assistance.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>29</td>
<td>I wish that I could change what had happened.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
APPENDIX I

Big Five Inventory (BFI: John, Donahue, & Kentle, 1991)

Below are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please select the button corresponding the extent to which you agree to disagree with that statement.

Responses will be…

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree</td>
<td>a little</td>
<td>nor disagree</td>
<td>a little</td>
<td>Agree</td>
</tr>
</tbody>
</table>

I see myself as someone who …

1. is talkative
2. is depressed, blue
3. is reserved
4. is relaxed, handles stress well
5. is full or energy
6. can be tense
7. generates a lot of enthusiasm
8. worries a lot
9. tends to be quiet
10. is emotionally stable, not easily upset
11. has an assertive personality
12. can be moody
13. is sometimes shy, inhibited
14. remains calm in tense situations
15. is outgoing, sociable
16. gets nervous easily
APPENDIX J

Cognitive Appraisal of Health Scale (CAHS; Ahmad, 2005).

Below are several statements concerning your feelings toward the MS-related problem you described earlier. Please select the button corresponding to your level of agreement with each item.

Responses will be…

| Strongly Disagree | Disagree | Neither | Agree | Strongly Agree |

1. I can control what will happen to me.
2. I have not been able to do what I want to do because of this health problem.
3. The health problem is frightening to me.
4. This health problem isn’t stressful to me.
5. This health problem has damaged my life.
6. I can beat this health problem, despite the difficulties.
7. I have a sense of loss over things I can no longer do.
8. I have a lot to lose because of this health problem.
9. I worry about what will happen to me.
10. Relationships with my family and friends have suffered.
11. I have been harmed in some way by this health problem
12. I don’t think much about this health problem
13. There is a lot I can do to overcome this health problem.
APPENDIX K

Satisfaction with Life Scale. (SWLS; Diener, Emmons, Larsen, & Griffin, 1985)

Below are five statements with which you may agree or disagree. Please select the button corresponding to your level of agreement with each item. Please be open and honest in your responding.

Responses will be…

Strongly Disagree Slightly Neither Slightly Agree Strongly Agree

Disagree Disagree Agree Agree

1. In most ways, my life is close to my ideal.
2. The conditions of my life are excellent.
3. I am satisfied with my life.
4. So far I have gotten the important things I want in life.
5. If I could live my life over, I would change almost nothing.
APPENDIX L

Center for Epidemiologic Studies – Depression Scale (CES-D; Radloff, 1977).

Instructions:
Below is a list of some of the ways you may have felt or behaved. Please indicate how often you have felt this way during the past week by using the scale provided.

- Rarely (less than 1 day)
- Sometimes = (1-2 days)
- Occasionally (3-4 days)
- Most of the time = (5-7 days)

1. I was bothered by things that usually don’t bother me.
2. I did not feel like eating; my appetite was poor.
3. I felt that I could not shake off the blues even with help from my family or friends.
4. I felt that I was just as good as other people.
5. I had trouble keeping my mind on what I was doing.
6. I felt depressed.
7. I felt that everything I did was an effort.
8. I felt hopeful about the future.
9. I thought my life had been a failure.
10. I felt fearful.
11. My sleep was restless.
12. I was happy.
13. I talked less than usual.
15. People were unfriendly.
16. I enjoyed life.
17. I had crying spells.
18. I felt sad.
19. I felt that people disliked me.
20. I could not get “going.”
APPENDIX M

Beck Anxiety Inventory for Primary Care (BAI-PC: Beck, Steer, Ball, Ciervo, & Kabat, 1997).

Below is a list of common symptoms. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by selecting the button corresponding to your answer.

Responses include…

Not at All  Mildly, but it didn’t bother me much  Moderately – it wasn’t pleasant at times  Severely - it bothered me a lot

1. Unable to relax
2. Fear of worst happening
3. Terrified or afraid
4. Nervous
5. Fear of losing control
6. Fear of dying
7. Scared
APPENDIX N

Mental Health Inventory (MHI). A subscale of the Multiple Sclerosis Quality of Life Inventory (MSQLI: Fischer, LaRocca, Miller, Ritvo, Andrews, & Paty, 1999).

The following questions are about how you feel, and how things have been for you during the past 4 weeks. Please select the button corresponding to your response. If you are not sure which answer to select, please choose the one answer that comes closest to describing you.

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<th>Most of the time</th>
<th>A good bit of the time</th>
<th>Some of the time</th>
<th>A little bit of the time</th>
<th>None of the time</th>
</tr>
</thead>
</table>

1. Has your daily life been full of things that were interesting to you?
2. Did you feel depressed?
3. Have you felt loved and wanted?
4. Have you been a very nervous person?
5. Have you been in firm control of your behavior, thoughts, emotions, and feelings?
6. Have you felt tense or high-strung?
7. Have you felt calm and peaceful?
8. Have you felt emotionally stable?
9. Have you felt downhearted and blue?
10. Were you able to relax without difficulty?
11. Have you felt restless, fidgety, or impatient?
12. Have you been moody or brooded about things?
13. Have you felt cheerful, light-hearted?
14. Have you been in low or very low spirits?
15. Were you a happy person?
16. Did you feel you had nothing to look forward to?
17. Have you felt so down in the dumps that nothing could cheer you up?
18. Have you been worried or anxious?
APPENDIX O

Social Support Questionnaire (SSQ; Zich & Temoshok, 1987).

Below is a list of eight types of help/support. For each item, please indicate how
(1) DESIRABLE you believe this type of support would be for you at this time in
your life,
(2) how AVAILABLE this type of support would be if you wanted it,
(3) how often you have EXPERIENCED this type of support during the past
month, and
(4) how USEFUL this type of support has been when you received it.

Please select the response which indicates your experience DURING THE PAST
MONTH.

1. Someone to talk to.
2. Someone who understands your problems and feelings.
3. Someone who expressed confidence in you.
4. Someone who gives you suggestions or advice about how to solve a problem.
5. Someone who explains or shows you how they dealt with problems similar to
your own.
6. Someone to whom you can turn when you need to borrow something (like a
household object or money) or need help with an errand.
7. Someone who is there for you.
8. Someone who will do something to change your situation so you’ll be under less
stress.
APPENDIX P

Means, standard deviations, and univariate $F$'s assessing significant differences between groups, based on gender.

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Note.  * $p<.05$  
   ** $p<.01$
APPENDIX Q

Means, standard deviations, and univariate F’s for dependent variables which yielded significant differences between groups, based on disease course.

|                                      | Progressive (n = 79) | Relapsing Remitting (n = 250) |  
|--------------------------------------|----------------------|------------------------------|---
|                                      | M       | SD   | M       | SD   | F  
| Problem Solving                      | 18.52  | 3.49 | 18.77  | 3.37 | .38  
| Physical Assistance                  | 13.73  | 3.43 | 10.15  | 3.84 | 29.62**  
| Emotional Release                    | 8.41   | 2.45 | 8.47   | 2.01 | .13  
| Avoidance                            | 12.14  | 2.81 | 13.23  | 3.01 | 1.94  
| Personal Health Control              | 9.94   | 3.90 | 9.91   | 3.56 | .26  
| Acceptance                           | 16.86  | 4.10 | 17.23  | 3.49 | .52  
| Energy Conservation                  | 10.72  | 2.78 | 10.89  | 2.66 | .36  
| Harm Appraisals                      | 19.00  | 4.46 | 16.67  | 4.62 | 7.77**  
| Threat Appraisals                    | 18.42  | 4.32 | 18.91  | 3.87 | 2.17  
| Challenge Appraisals                 | 8.14   | 2.91 | 9.34   | 2.63 | 7.67**  
| Extraversion                         | 25.78  | 3.28 | 26.20  | 3.59 | 1.21  
| Neuroticism                          | 25.32  | 3.41 | 26.42  | 3.35 | 3.49  
| Life Satisfaction (SLWS)             | 16.08  | 8.03 | 20.20  | 7.59 | 11.77**  
| Depression (CES-D)                   | 43.70  | 11.62 | 43.68 | 12.83 | .07  
| Anxiety (BAI-PC)                     | 12.97  | 5.07 | 13.80  | 5.00 | 5.08*  
| Mental Health (MHI)                  | 75.06  | 18.17 | 74.58 | 16.92 | .30  
| Social Support: Frequency            | 24.82  | 6.00 | 26.05  | 6.53 | .67  
| Social Support: Utility              | 33.66  | 4.33 | 33.68  | 4.80 | .01  
| Social Support: Availability         | 25.43  | 6.38 | 27.19  | 6.61 | 2.12  
| Social Support: Desirability         | 33.56  | 5.02 | 34.12  | 4.69 | .34  

Note. * p<.05  
** p<.01
Correlation matrix used to perform structural equation modeling procedures. This includes correlations between measures of coping, appraisal, personality, depression, anxiety, mental health, and social support in the entire sample of MS patients (\(N = 329\)).

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Note. Correlations are expressed using three decimal places to allow for replication of SEM procedures. Prob = problem solving coping, Pers = personal health control coping, Acc = acceptance coping, Har = harm appraisals, Thre = threat appraisals, Chal = challenge appraisals, Ext1 = extraversion parcel 1, Ext2 = extraversion parcel 2, Ext 3 = extraversion parcel 3, Neu1 = neuroticism parcel 1, Neu2 = neuroticism parcel 2, Neu3 = neuroticism parcel 3, CES = Center for Epidemiologic Studies Depression Scale, BAI = Beck Anxiety Inventory for Primary Care, MHI = Mental Health Inventory, SSF = frequency of social support, SSU = utility of social support, and SSA = availability of social support.
### Appendix R (continued)

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Note. Correlations are expressed using three decimal places to allow for replication of SEM procedures. Neu1 = neuroticism parcel 1, Neu2 = neuroticism parcel 2, Neu3 = neuroticism parcel 3, CES = Center for Epidemiologic Studies Depression Scale, BAI = Beck Anxiety Inventory for Primary Care, MHI = Mental Health Inventory, SSF = frequency of social support, SSU = utility of social support, and SSA = availability of social support.
Figure S.1. Path diagram of the Traditional Direct Effects Model
Figure S.2. Path diagram of the Traditional Stress Buffering Model
Figure S.3. Path diagram of the Personality Direct Effects Model
Figure S.4. Path diagram of the Personality Stress Buffering Model
Figure S.5. Measurement model for the Traditional Direct Effects Model.
Figure S.6. Measurement model for the Traditional Stress Buffering Model.
Figure S.7. Measurement model for the Personality Direct Effects Model.
Figure S.8. Measurement model for the Personality Stress Buffering Model.
Figure S.9. Parameter estimates for the Personality Stress Buffering Model. This model includes estimates for all free parameters representing linear relationships.
Figure S.10. Parameter estimates for the Personality Direct Effects Model. This model includes estimates for all free parameters representing linear relationships.
Figure S.11. Path diagram of the Personality Mixed Effects Model.
Figure S.12. Measurement model for the Personality Mixed Effects Model.
Figure S.13. Parameter estimates for the Personality Mixed Effects Model. This model includes estimates for all free parameters representing linear relationships.
LIST OF REFERENCES


