

**THE ROLE OF PSYCHOLOGICAL FACTORS IN DETERMINING POSITIVE  
AND NEGATIVE OUTCOMES IN INDIVIDUALS WITH MS: AN  
ATTACHMENT PERSPECTIVE**

by

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## **ABSTRACT**

Multiple Sclerosis (MS) is an autoimmune disease of the central nervous system. Elevated rates of depression (Giordano et al., 2013), anxiety (Goretti et al., 2009), and reduced quality of life (Yamout et al., 2013) have been reported in individuals with MS. The objectives of the study were: to provide a comprehensive psychological profile of individuals with MS and identify factors that predict quality of life. A total of 187 individuals completed a questionnaire package assessing psychological and outcome variables. Staff obtained objective measurements of disease status. Results revealed that being employed predicted higher Physical Health Composite scores. Dysfunctional Coping, higher MS disability scores, Depression, and Anxiety each predicted lower Physical Health Composite scores. Experiencing a relapse, and having greater Neuroticism, Dysfunctional Coping, Depression, and State Anxiety each predicted lower Mental Health Composite scores. Thus, as part of disease management, individuals with MS may require psychological interventions to enhance overall functioning.

## **DEDICATION**

For Kieran, Gabriel, Michel, and Madeleine Barrett

“I’ll love you forever,  
I’ll like you for always,  
as long as I’m living  
my baby you’ll be.”

~ Robert Munsch

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“With all its sham, drudgery, and broken dreams, it is still a beautiful world. Be cheerful. Strive to be happy.” – Max Ehrmann.

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## **The Role of Psychological Factors in Determining Positive and Negative Adjustment Outcomes in Individuals with MS: An Attachment Perspective**

Multiple sclerosis (MS) is an autoimmune disease of the central nervous system (i.e., brain and spinal cord), with an onset typically observed in young adulthood (Multiple Sclerosis Society of Canada, 2018). Symptoms range from impairment of sensory, motor, and visual systems, to cognitive dysfunction (Sá, 2012). MS affects three times as many women than men (Multiple Sclerosis Society of Canada, 2018). Based on data from the 2010/2011 Canadian Community Health Survey (i.e., the most recent nationally representative sample assessing the prevalence of MS and other neurological conditions), Gilmour, Ramage-Morin, and Wong (2018) reported that the number of people in Canadian households who indicated they have MS is 93,500; the prevalence is 290 per 100,00 individuals. Beck, Metz, Svenson, and Patten (2005) noted that the prevalence of MS in Canada is one of the highest in the world (240 per 100,000 individuals at the time of their study). Beck et al. also reported regional differences in MS prevalence. In Atlantic Canada, the prevalence was higher than the national average at 350 per 100,000 individuals. It is currently unknown what may account for these differences, although Beck et al. suggested environmental influences may be a contributing factor.

A diagnosis of MS is time consuming and complex. When a patient presents with symptoms that are suggestive of MS, radiological and lab testing are carried out. According to the McDonald Criteria from the International Panel on Diagnosis of MS (McDonald et al., 2001; Polman, Reingold, Banwell, et al., 2011; Polman, Reingold, Edan, et al., 2005), diagnosis involves a clinical assessment and the identification of MRI

abnormalities, including the dissemination of lesions in space and time (i.e., lesions are noted in more than one area within the CNS, and they occurred at different times).

Diagnosis also follows the ruling out of all other possible diagnoses associated with the clinical presentation (McDonald et al., 2001; Polman, Reingold, Banwell, et al., 2011; Polman, Reingold, Edan, et al., 2005). The 2017 Panel (i.e., International Panel on Diagnosis of MS) recently revised the 2010 McDonald Criteria; the revised criteria includes the acceptance of cerebrospinal fluid findings (i.e., CSF specific oligoclonal bands), symptomatic lesions (as MRI evidence of dissemination in space and time; previously only asymptomatic lesions were accepted) and cortical lesions (as MRI evidence of dissemination in space) in the diagnosis of MS (Thompson et al., 2018).

There are several types of MS, including: clinically isolated syndrome, relapsing-remitting MS, secondary-progressive MS, and primary-progressive MS (Multiple Sclerosis Society of Canada, 2018). Although clinically isolated MS (CIS) refers to a single episode of neurological symptoms suggestive of MS, diagnostic imaging (i.e., MRI) may reveal evidence of other abnormalities/attacks. Relapsing-remitting MS (RRMS), the most common type of MS at diagnosis, is characterized by relapses (i.e., exacerbations) during which new symptoms may appear and/or existing symptoms may worsen. During remissions, the period between the relapses, patients experience complete or nearly complete recovery of function.

Secondary-progressive MS (SPMS) is diagnosed following a diagnosis of RRMS. According to the MS Society of Canada (2018), nearly half of those diagnosed with RRMS will be classified as having SPMS within 10-20 years. SPMS is diagnosed when a patient with RRMS experiences steady disease progression, and there is no longer a clear

distinction between relapse and remission. Primary-progressive MS is characterized by a slow accumulation of disability from the outset; although there may be occasional periods of stability or minor improvement, there are no defined periods of relapse or remission. According to the MS Society of Canada (2018), approximately five percent of those with primary-progressive MS experience a steady worsening of disease from the outset, with relapses. There is also a subgroup of individuals with MS who are classified as having Benign MS, which is a controversial classification that refers to a mild form of the disease in which there is minimal disability or disease progression decades after disease onset (Correale et al., 2012).

During an exacerbation of MS symptoms, acute inflammation and demyelination lead to failure of axonal transmission at the site of a lesion (Sá, 2012). Early in the disease process, this may occur for functional reasons, but as the disease progresses the cause may become structural, as axons are no longer able to repair, and thus are exposed and injured, leading to irreversible damage. Axons may also be directly injured. Additionally, there may be enough inflammation to produce clinical symptoms in the absence of demyelination. Clinical manifestations, remission, and disease progression are unpredictable (Sá, 2012). In a sample of 297 individuals with MS, 71% reported experiencing MS related pain (Piwko et al. (2007).

Piwko et al. (2007) examined the direct and indirect costs of MS related pain (i.e., through physician and patient surveys). They used national demographic information and prevalence rates to extrapolate the economic burden of MS pain to the population. The estimated cost of pain in Canadian individuals with MS over a six-month period (in 2004 Canadian dollars) was \$79, 444, 888.

Given the unpredictable nature of MS and present lack of a cure, it is not surprising that there is a substantial and long-lasting impact on the individual (Somerset, Peters, Sharp, & Campbell, 2003), including elevated rates of depression (Giordano et al., 2013), anxiety (Goretti et al., 2009), and reduced quality of life (Yamout et al., 2013). There is evidence that individuals with MS experience worse objective and subjective quality of life than people in the general population (McCabe & McKern, 2002); however, a wide range of individual differences in psychological and emotional adjustment have been reported (Benito-León, Morales, Rivera-Navarro, & Mitchell, 2003). Thus, it stands to reason that a comprehensive exploration of the factors leading to positive and negative adjustment outcomes (i.e., quality of life) would be beneficial to individuals with MS and their families. For the purposes of the present study, quality of life refers to health-related quality of life, a multidimensional construct encompassing physical and mental health in individuals with MS (Vickrey, Hays, Harooni, Myers, & Ellison, 1995).

Although numerous studies have examined disease severity and duration as predictors of various outcomes, psychological factors have been shown to be consistently better predictors of individual differences in adjustment than illness factors (Dennison, Moss-Morris, & Chalder, 2009). Further, psychological factors are often modifiable which makes them potential targets for intervention. A number of psychological factors have been linked to adjustment outcomes in individuals with MS. In their sample, Goretti et al. (2009) found that individuals with MS employed more avoidant coping strategies and had higher levels of anxiety and depression than the general population; however, those who made use of positive attitude strategies and social support reported greater

mental quality of life, in addition to higher overall quality of life. Ryan et al. (2007) noted that the individuals with MS in their sample reported higher rates of distress and lower health-related quality of life than healthy individuals without the disease. They also found that social support emerged as a powerful predictor of well-being in individuals with MS.

Yamout et al. (2013) called for more comprehensive research on quality of life in individuals with MS, which is in line with a number of limitations identified in the literature. At the time of their study, Yamout et al. could not find any other studies that comprehensively assessed the role of demographic, clinical, psychological, social, and economic factors that impact individuals with MS' perceptions of quality of life.

Somerset et al. (2003) noted that research frequently focused on the measurement of depression or fatigue as outcome variables rather than quality of life. Benito-León et al. (2003) conducted a review assessing the impact of MS on health-related quality of life. Benito-León et al. noted that, for many years, research focused on disease related outcomes and the first investigation focused on health-related quality of life in individuals with MS was published in 1992. At the time of their review, health-related quality of life instruments were rarely incorporated into randomized controlled trials as a primary or secondary outcome measure.

There has been a shift, however, towards examining quality of life as an outcome measure in MS (Bandari, Vollmer, Bhupendra, & Tyry, 2010). Bandari et al. conducted a review to examine the ways in which quality of life is assessed in individuals with MS. The authors noted that generic measures lack the sensitivity to capture true health-related quality of life changes specific to individuals with MS; they emphasized how the use of MS specific, versus generic measures, are valuable in obtaining a more comprehensive

view of health-related quality of life outcomes in individuals with MS. In recent years, researchers have begun exploring psychological (Lex et al., 2018; Strober, 2017) and disease related factors (Colbeck, 2018) that predict quality of life in individuals with MS, as well as evaluating specific psychological interventions to improve quality of life (Kidd et al., 2017).

Indeed, individuals with MS indicate that quality of life is not only important, but also more important to them than level of disability (Rothwell, McDowell, Wong, & Dorman, 1997). Rothwell et al. compared judgments of clinicians and individuals with MS to determine which domains of health were most important to patients. They found that clinicians and patients had similar ratings of the importance of physical disability; however, these measures did not correlate with overall health-related quality of life measures (i.e., quality of life, general health, mental health). Patients rated these quality of life measures as more important than clinicians whereas clinicians were more likely to rate physical functioning and physical role limitations as more important and were less concerned with mental health and emotional role limitations. Patients also scored lower (than controls) on the quality of life measures they rated as most important to them. Rothwell et al. noted that it is not that patient views are “more important” than those of the physician, but that their views should be considered in the selection of outcome measures for trials and to evaluate treatment itself. Ysraelit, Fiol, Gaitán, and Correale (2017) also found a gap between physicians and patients regarding quality of life concerns. They reported that physicians considered physical function and physical role limitations (followed by emotional role limitations) to be significantly more important than patients rated them; patients did consider these important but also considered other

aspects of their health-related quality of life (e.g., vitality, mental health) to be important to them.

Ryan et al. (2007) reported that physician ratings of patients' functional abilities, in their sample of individuals with MS, more strongly correlated with ratings of caregivers than those of patients. They concluded that caregiver reports might also be a helpful addition to the evaluation process. Janse et al. (2004) summarized the results of six studies in terms of agreement between adult patients and physicians on the assessment of quality of life; in three of the studies, the percentage of agreement between doctor and patient was analyzed. The lowest agreement was found amongst the domains of emotion, feelings, and social functioning; the greatest agreement varied across the studies but included pain, overall health, role, and daily activities (Janse et al., 2004). Despite the suboptimal agreement between physicians and patients regarding the impact of MS on psychological factors, the literature reviewed below will highlight the role of these variables in determining patients' outcomes.

### **Impact of Psychological Factors on Disease Outcomes: An Attachment Framework**

The present study sought to address some of the gaps/limitations in the literature through a comprehensive assessment of the relationships between psychological factors and those factors resulting from the disease process (i.e., physical manifestations of the disease), to determine what predicts disease related and psychological health outcomes, and positive and negative adjustment outcomes (i.e., quality of life) in individuals with MS.

Interpersonal factors, especially social support, have been shown to be powerful predictors of health outcomes (Uchino, 2013; Uchino, Bowen, Carlisle, & Birmingham,

2012). Pietromonaco, Uchino, and Dunkel Schetter (2013) noted that although there is ample literature linking relationships and health, little is known about the nature in which interpersonal relationships impact physiological processes or disease outcomes; findings in the field of relationship science have not been integrated with those in the health literature. Attachment theory is useful in understanding how individuals engage with significant others in the face of distress and the impact this has on other areas of functioning and health (Pietromonaco et al., 2013). Stressors, such as illness, activate the attachment system, triggering proximity seeking to gain comfort and confirm/reestablish bonds (Mikulincer & Shaver, 2007). Due to dealing with disease related stress, individuals with chronic illness may have depleted psychological resources and thus, may be particularly vulnerable to negative responses they receive from their partners. They may interpret these as a sign of rejection and a threat to the relationship and their self-esteem (Kleiboer et al., 2007).

Attachment theory can provide a framework and a basis for understanding the connections between intrapersonal/interpersonal processes and health (Pietromonaco & Beck, 2015). The field of attachment is well supported and the connections between relationships and health have also been well established (Pietromonaco et al., 2013); however, as noted by Pietromonaco et al., more research is needed to explore the *process* through which relationships impact health outcomes.

**Attachment in Childhood.** From the earliest interactions between child and caregiver (Bowlby, 1973; 1980; 1982) to relationships across situations and times (Ainsworth, 1989; Bowlby, 1982), attachment theory has been conceptualized as a framework for understanding human relationships. The attachment behavioural system is

described as a biologically based, innate system that evolved to protect individuals from harm (Bowlby, 1982; Pietromonaco & Beck, 2015). Infants engage in a host of proximity seeking behaviours (e.g., crying, clinging) to caregivers in order to ensure protection from danger or threat (Ainsworth, 1989; Bowlby, 1982). According to Bowlby, if a child is in the presence of their primary attachment figure or feels they are within easy reach, they will feel secure and use their caregiver as a base from which to explore. The attachment system also functions to regulate negative emotions and restore a sense of felt security (Bowlby, 1973; Pietromonaco & Beck, 2015). It has been described as a regulatory system in which distressed individuals seek out attachment figures who, in turn, respond in ways that either facilitate or inhibit efforts to cope with stressful situations, downregulate distress, and restore emotional calm and security (Pietromonaco & Beck, 2015). Bowlby (1988) noted that turning to one's attachment figure in times of adversity or threat is a normative and healthy response.

Over time, expectations, based on the availability and responses of attachment figures, are organized into mental representations of others and the self. Bowlby referred to these as internal working models (Bowlby, 1973; 1982). They guide expectations and attachment strategies and indicate to a child how acceptable or worthy of care they are in the eyes of others. These models of the self and others develop in a confirming and complementary manner. According to Bowlby, a child's response to stressful situations is linked to their determination of whether their caregiver will be responsive, with unavailability leading to susceptibility of responding to stressful situations fearfully. In addition, when a child is threatened with abandonment, the effects of any actual separation will be magnified and likely to persist. High incidence of separation threats,

and/or actual separation, in addition to instabilities in the home, may increase susceptibility to the development of anxious attachments and psychological disorders (Bowlby, 1973).

Ainsworth, Blehar, Waters, and Wall (1978) expanded on Bowlby's theory and developed a procedure called the "Strange Situation" to assess infant-mother attachment in children who were 11 to 18 months of age; behaviours observed were later linked to behaviours within the home. During the procedure, infants experienced a series of brief separations and reunions with their caregiver. Ainsworth et al. (1978) observed three patterns of attachment behaviour: secure, insecure-avoidant, and insecure-resistant/ambivalent.

Infants who were identified as secure were likely to be temporarily distressed upon separation, but willing to explore during that time, and readily comforted upon reunion with their mother. Avoidant children were more likely to demonstrate a lack of distress upon separation with their caregiver and to avoid them when reunited. Those who were classified as resistant/ambivalent, displayed preoccupation with the caregiver, sought them during the period of separation, and engaged in behaviours of both seeking and resisting upon reunion. Main and Solomon (1990) noted that not all infants fit into the traditional patterns of attachment identified by Ainsworth et al. (1978). They outlined a set of indices of disorganization and disorientation of behaviours in the Strange Situation that led to the identification of a fourth pattern which they termed disorganized and/or disorientated. Main and Solomon described the behavior of children who have disorganized/disoriented attachment patterns as including one (or more) of the following: 1) sequential display of contradictory behavior patterns; 2) simultaneous display of

contradictory behavior patterns; 3) undirected, misdirected, incomplete, and interrupted movements and expressions; 4) stereotypes, asymmetrical movements, mistimed movements, and anomalous postures; 5) freezing, stilling, and slowed movements and expressions; 6) direct indices of apprehension regarding the parents; and, 7) direct indices of disorganization or disorientation. As an example, Main and Solomon described the second feature, the simultaneous display of contradictory behavior patterns, as one where an infant displays avoidance at the same time as proximity seeking; thus, an infant may approach a parent but do so with their head averted.

**Attachment in Adulthood.** Attachment bonds can be distinguished from other relationships based on a number of characteristics (Ainsworth, 1989; Bowlby, 1982; Weiss, 1991). The characteristics of childhood attachment bonds are also present in adulthood and across multiple relationships (Doherty & Feeney, 2004; Weiss, 1991): there is a need to maintain proximity with the attachment figure, distress upon separation, joy when reunited, and grief when loss occurs. There is an experience of, or the seeking of, security, obtained from an individual who is not interchangeable with another. Based on this feeling of security, similar to when a child explores from their “secure base,” an adult feels confident to engage in activities and experiences outside of the relationship. These ties are long lasting and, as explained by Weiss (1991), so persistent that separation protest occurs despite conscious knowledge that an individual is inaccessible in death. Proximity seeking under conditions of perceived threat endures, even when an attachment figure has been neglectful or abusive.

Although the working models of adulthood attachment are more complex and nuanced than those of childhood due to variables such as cognitive abilities, life

experience, and circumstances (Bowlby, 1982; Pietromonaco & Beck, 2015), working models are largely based on a representative or prototypical view of attachment figures and relationships that comes from interactions with early caregivers. As such, they often bias information processing concerning relationships and partners (Mikulincer & Shaver, 2007). Thus, in adulthood, an individual may unconsciously seek relationship partners who confirm their negative views of the self or they may unconsciously engage in behaviours that push partners away, thus confirming their lack of value to others. By projecting one's models onto others, every piece of information related to the partner, the relationship, and ultimately the self, is put through the lens of the existing models and as such, expectations are frequently confirmed by the relationship partner, making the models increasingly stable over time and resistant to change (Mikulincer & Shaver, 2007).

In their groundbreaking paper, Hazan and Shaver (1987) conceptualized romantic love as an attachment process. They sought to apply Bowlby (Bowlby, 1973; 1980; 1982) and Ainsworth's (Ainsworth et al., 1978) ideas and findings to the field of adult love. As noted by Hazan and Shaver (1987), no one at that time had investigated 1) Bowlby's idea that continuity in relationship styles (i.e., romantic relationships) was influenced by internal working models of the self and social life, or 2) that the characteristics of the parent-child relationships identified by Ainsworth et al. (1978) were not only probable causes of differences in attachment style in infants, but also differences in romantic attachment styles in adults. They developed a procedure to classify adults into three categories corresponding to the three attachment styles of childhood (secure, insecure-avoidant, and insecure-resistant/ambivalent), identified by Ainsworth et al. (1978).

Across two studies, Hazan and Shaver (1987) identified 56% of participants as secure, 24% as avoidant, and 20% as anxious/ambivalent. They found that secure individuals described their most significant love relationships as happy, friendly, and trusting. They reported that they felt they were able to accept and support their partners despite their faults. Their relationships also tended to last longer than those of their avoidant and anxious/ambivalent counterparts. Participants who were avoidant described their relationships as characterized by fear of intimacy, with emotional highs and lows and jealousy. Those who were anxious/ambivalent reported their experiences in love as obsessive, with a great desire for reciprocity and union, emotional highs and lows, and extreme sexual attraction and jealousy (Hazan & Shaver, 1987). Hazan and Shaver (1987) also found that these styles were related to the underlying working models of the self and others, as identified by Bowlby (1973). This plays out through an individual's beliefs on the availability and responsiveness of their relationship partners as well as perceptions of one's own worthiness of love/care.

Bartholomew and Horowitz (1991) also drew on the work of Bowlby (1973; 1980; 1982) to develop a new model of attachment in adulthood. Their four-category, prototypical model of attachment, is based on the internal working models of the self and others. In this model, the four categories were conceived based on the idea that if the model of self and of others were both dichotomized into positive and negative views, then four resulting combinations could be conceptualized consisting of secure, preoccupied, fearful-avoidant, and dismissive-avoidant styles. Bartholomew and Horowitz (1991) noted how they built upon the work of Main (who developed the Adult Attachment Interview - an interview method used to classify adults into attachment

groups paralleling the three patterns of childhood) and Hazan and Shaver (who developed a self-report procedure to classify adults into three categories corresponding to the three attachment styles of childhood). According to Bartholomew and Horowitz (1991), in Main's work, avoidant adults (as classified by their *interview method*) were identified as people who denied experiencing distress and downplayed attachment; whereas, Hazan and Shaver's *self-report method* identified people who reported distress and discomfort when they became close to others. Thus, Bartholomew and Horowitz (1991) thought a single avoidant category might obscure patterns of avoidance that could be conceptually separated. In the model, they introduced four categories, and assessed participants using both interview and self-report methods.

According to Bartholomew and Horowitz (1991), secure individuals have a positive view of the self and others, are comfortable with intimacy and autonomy, and feel a sense of worthiness through the expectation that others will be generally accepting and responsive. Those who are preoccupied hold negative views of the self and positive views of others. They strive to feel worthiness through gaining the acceptance of others. Fearfully-avoidant individuals possess negative views of themselves and others. They protect themselves from the rejection they anticipate, by avoiding involvement with others. Finally, those who are dismissive-avoidant see themselves in a positive light while holding a negative view of others. They are likely to protect themselves from the disappointment of others by avoiding close relationships.

As noted by Brennan, Clark, and Shaver (1998), many attachment questionnaires have been proposed since Hazan and Shaver's (1987) work, resulting in confusion for researchers in terms of which self-report measure to use. Brennan et al. asserted that

attachment may be better assessed on a continuum of two primary dimensions (i.e., Avoidance and Anxiety) rather than categorically. Although there has been much debate in the attachment field surrounding the use of categorical versus dimensional measures, Fraley, Hudson, Heffernan, and Segal (2015) also found that the dimensional model of attachment appears to be the best suited for conceptualizing and measuring attachment.

Specifically, the avoidant dimension is characterized by a lack of comfort in depending on close others and the need for self-reliance and emotional distance (i.e., deactivating strategy). Reversibly, anxious individuals have a strong desire for comfort and closeness, and frequently engage in attempts to confirm their partner's availability and responsiveness, and their worth to the partner (i.e., hyperactivating strategy).

Securely attached individuals score low on both avoidance and anxiety. Their expectations (concerning the availability and responsiveness of their partners) are combined with a sense of comfort in the nature of their relationships, and the ability to cope constructively (Mikulincer & Shaver, 2007).

### **Personality, Social Support and Coping within an Attachment Framework**

**Personality.** From a theoretical perspective, attachment security has been linked to the development of personality (Fransson, Granqvist, Bohlin, & Hagekull, 2013). As noted by Fransson et al., early experiences with caregivers and subsequent views of others and the self are believed to set the stage for the acquisition of a broad range of behaviours (e.g., emotion regulation, social skills), which are thought, from an environmental perspective, to influence the development of personality.

A frequently applied model known as the Big Five or the Five Factor Model of Personality (Costa & McCrae, 1992), conceptualizes personality traits as stemming from

five broad dimensions. Costa and McCrae proposed that the overarching dimensions of personality consist of Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. Neuroticism is characterized by a tendency to experience negative affect such as fear, sadness, guilt, or embarrassment. Those who score high in Neuroticism are more likely to experience negative thoughts, difficulty controlling their impulses, and to cope poorly with stress. Scoring high on Extraversion is associated with greater assertiveness, optimism, and talkativeness. These individuals frequently seek excitement and stimulation. Openness to Experience refers to a tendency to possess an active imagination, intellectual curiosity, attentiveness to inner feelings, and independence of judgment. Individuals scoring high on Agreeableness are likely to be sympathetic, and fundamentally altruistic. Finally, Conscientiousness refers to a tendency to be purposeful, strong-willed, and scrupulous.

Researchers have examined relationships between attachment and personality (Both & Best, 2017; Hagekull & Bohlin, 2003; Nofle & Shaver, 2006; Shaver & Brennan, 1992). Hagekull and Bohlin examined the relationships between infant temperament and attachment, and middle childhood personality. They found that extraversion was most clearly related to infancy data; it was predicted by both temperament and attachment security. They also found that secure attachment was associated with less neuroticism and greater openness. In a longitudinal study assessing the concurrent and prospective links between attachment and personality, Fransson et al. (2013) found that attachment security in middle childhood (i.e., 8.5 years old) was positively related to extraversion and openness. Unresolved/disorganized attachment at age 21 was negatively associated with conscientiousness and positively related to

openness. They also found that secure attachment at 8.5 years old, was significantly related to greater extraversion and close to significantly related to agreeableness and openness at 21 years of age.

Shaver and Brennan (1992) conducted a longitudinal study, in a sample of introductory psychology students and their dating partners, exploring the connections between attachment and the Big Five personality traits, including their relationships to each other and relationship outcomes. They found that secure individuals were less neurotic and more extraverted than those who were insecure, and secure individuals were more agreeable than those who were avoidant. Although no statistically significant differences were observed between the two insecure groups, it was noted that anxious ambivalent participants were slightly more neurotic, extraverted and agreeable than avoidant participants.

Noftle and Shaver (2006) assessed the relationships between attachment related avoidance and anxiety and the Big Five facets and reported that anxiety in particular, but avoidance as well, were positively correlated with neuroticism. Avoidance showed larger negative correlations with agreeableness than anxiety, and both dimensions were also negatively associated with a number of the facets of extraversion, openness, and conscientiousness. Both and Best (2017) examined relationships between attachment (based on two attachment measures - the Relationship Questionnaire and the Relationship Scales Questionnaire) and personality (including the five factors and facets comprising the NEO PI-R) in a sample of undergraduates. Both and Best found that having secure attachment was related to less neuroticism and greater extraversion. Fearful and preoccupied attachment patterns were associated with greater neuroticism and lower

agreeableness; fearful individuals also scored lower on extraversion. At the facet level, the authors noted that the three insecure patterns of attachment on both attachment measures were associated with depression and low trust. In sum, there are established relationships that exist between attachment patterns and personality.

**Social Support.** Attachment security has been related to the manner in which one perceives support from others (Mikulincer & Shaver, 2007). Social support can be defined as any process through which social relationships facilitate health and well-being (Cohen, Underwood, & Gottlieb, 2000). According to Cohen et al., social relationships influence health through different processes including: 1) the provision or exchange of emotional, informational, or instrumental resources in response to another individual perceived to be in need of assistance; and, 2) the health benefits derived from participating in social groups that are believed to influence cognitions, emotions, behaviours, and biological responses in ways beneficial to health and well-being. Although the characteristics of social relationships have the potential to maintain or promote physical and psychological health, these characteristics also have the potential for harm (e.g., interpersonal conflict with family members, inappropriate/detrimental aid provided to individuals in need) (Cohen et al. 2000).

According to Sarason and Sarason (2006), there is value in examining social support processes in the context of close relationships, as well as considering both the positive and negative aspects of relationship functioning. Perceived social support is characterized by the feeling of being unconditionally loved and accepted by another and is influenced by both intrapersonal (i.e., an individual's pattern of perceiving relationships based on internal working models of the self and others) and interpersonal

(i.e., observable features of a relationship) factors (Sarason, Sarason, & Pierce, 1990). In any relationship, partners need to be able to solicit, detect, and provide social support when it is needed; however, differences, based on attachment styles, have been shown in social support processes (Pietromonaco & Beck, 2015). Secure individuals have been shown to be more likely to seek support, in ways that are both constructive and effective; however, those who are insecure are less likely to seek support and when they do, are less direct and less effective (Pietromonaco & Beck, 2015).

In a review of 40 studies, Mikulincer and Shaver (2007) found that anxious and avoidant adults were more likely to report lower levels of support and less satisfaction with received support. Rholes, Simpson, Campbell, and Grich (2001) found that insecure women (i.e., ambivalent) who perceived less support from their spouse in the prenatal period experienced larger declines in perceived support across the postpartum transition, which, in turn, was associated with greater declines in marital satisfaction. In sum, the reviewed literature highlights the relationship between insecure attachment and the perception of less social support.

**Coping.** Individuals develop a general pattern of responses for coping with distress that are guided by mental representations of attachment experiences (Mikulincer & Florian, 1997; Seiffge-Krenke & Beyers, 2005). According to Bowlby (1973), a child's response to stressful situations during the life course is linked to their determination of whether their caregiver will be responsive, with unavailability leading to greater likelihood of responding to stressful situations fearfully. Adaptation to stress involves a complex interplay of factors involving appraisal of a perceived threat (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen 1986), and the use of effective coping strategies.

Coping strategies are often been combined in the literature into overarching categories referred to as emotion-focused (e.g., regulating distressing emotions) or problem-focused (e.g., altering the person/environment causing distress; Folkman et al., 1986). Folkman et al. found that individuals, depending on how the situation/threat is perceived, might use both types of coping strategies. Coping is a complex process and either type of strategy may be beneficial depending on the situation, and whether it is perceived as controllable (Folkman & Moskowitz, 2004). Situations in which control is possible should be met with problem-focused methods of coping and those that are not, with emotion-focused strategies. In general, those who choose strategies that fit appraisals of control over a situation and show flexibility in terms of their coping will experience more positive outcomes (Folkman & Moskowitz, 2004).

In a seven-year prospective study, Seiffge-Krenke and Beyers (2005) assessed coping at five time points in adolescence and early adulthood. They found that differences in attachment were related to different growth patterns in coping trajectories. In general, they found that secure individuals engaged in less withdrawal and made greater use of their support networks. Securely attached individuals showed greater gains in active coping, including support seeking, over time, compared to dismissing individuals. Secure participants also had increases in their use of internal coping (e.g., reflecting on the situation) over time, as compared to preoccupied individuals.

Across six studies, Ein-Dor, Mikulincer, and Shaver (2011) examined the implicit procedural knowledge that organizes expectations, memories, and actions of people with different attachment styles. They found that insecure individuals had different schemas for coping with stressful situations. According to Ein-Dor et al., the hyperactivating

strategies of anxiously attached individuals (which arise from unreliable interactions with caregivers) are characterized by a sentinel schema that causes them to remain vigilant to all possible threats, react rapidly and early to threats, alert others, and seek proximity to them. The deactivating strategies of avoidant individuals (which arise from reactions to past, unavailable caregivers) also affect how they appraise and cope with a situation. They expect better outcomes if they suppress their needs/feelings and rely on themselves. They are likely to have constructed a rapid fight/flight schema, which can be characterized by minimizing the significance of a threat, taking self-protective action in the face of threat, and relying on themselves, rather than others, during such times.

Ein-Dor et al. (2011) found that anxious and avoidant individuals did access components of their proposed respective schemas in narratives of stressful events, and that they engaged in faster, deeper and more biased processing of information related to components of their schemas. They also found that anxious attachment was related to quicker detection of a threat. According to Ein-Dor et al., the implications of this are that in the absence of a fully secure base script which can mitigate the effects of stress, promote optimism and hope, and generally help secure people cope well with stress (Mikulincer & Shaver, 2007), the schemas of insecure individuals may distort interactions and close relationships. Additionally, biases of information related to components of one's schemas favours deeper, faster processing of schema related information and this might create a self-fulfilling prophecy about oneself in threatening situations.

## **Personality: A Potential Mechanism through which Attachment Influences Social Support and Coping**

There is evidence linking the Big Five personality model to social support processes (Swickert, 2009) and coping (Grant & Langan-Fox, 2006). In a chapter reviewing the relationships between personality and social support processes, Swickert (2009) noted that extraversion has been consistently related to perceived availability of support; extroverts are more likely than introverts to perceive greater availability of support and to seek out support from others when encountering a problem or stressor. Neuroticism has been associated with responses that include social withdrawal during periods of stress, more negative social interactions in general, and less perceived satisfaction with one's social support network. Those who are more agreeable have been shown to perceive greater available support. Less is known in the literature about the traits of conscientiousness and openness in terms of social support processes (Swickert, 2009).

In addition to playing a role in perceived social support, personality also influences coping strategies. Schneider, Rench, Lyons, and Riffle (2012) investigated aspects of personality on stress appraisals, affect, and performance on a mental arithmetic task. They found that neuroticism predicted higher threat appraisal, greater negative affect, and less positive affect. Additionally, neuroticism indirectly worsened performance, through appraisal of greater threat, while openness indirectly increased positive affect through lower threat appraisal. Grant and Langan-Fox (2006) examined the role of the Big Five traits in predicting stress, coping, and strain among 211 managers. They found that those who were high in extraversion and conscientiousness

engaged in more problem-focused coping (e.g., active coping and planning). However, individuals who scored high in neuroticism and low in conscientiousness used less problem-focused coping and engaged in more dysfunctional coping (e.g., behavioral disengagement and denial). Taken together, these results suggest that higher extraversion and conscientiousness coupled with lower neuroticism results in more positive coping strategies.

Although attachment has been shown to be related to specific personality traits (Both & Best, 2017; Nofle & Shaver, 2006), the way one perceives social support (Rholes et al., 2001), and the types of strategies we employ when confronted with stressful situations (Ein-Dor et al, 2011; Seiffge-Krenke & Beyers, 2005), personality has also been associated with perceived support (John, Naumann, & Soto, 2008) and coping (Grant & Langan-Fox, 2006), suggesting that it may play an underlying role in explaining the relationship between attachment and social support and coping. As mentioned by Uchino (2013) and Pietromonaco et al. (2013), there may be benefit in examining the mechanisms through which psychological, disease related, and adjustment outcomes are linked, in order to guide potential interventions.

### **Outcomes in Individuals with MS**

**Potential Correlates of Disease Related Outcomes.** Several decades of psychoneuroimmunology research have provided evidence indicating that psychosocial stress has implications for the immune system and the etiology of immune mediated diseases (Kemeny & Schedlowski, 2007; Segerstrom & Miller, 2004; Uchino, 2009). In healthy individuals, the changes in immune response following exposure to an acute psychological stressor are viewed as evolutionary, adaptive responses (i.e., immune

responses are sensitive to threatening/dangerous external stimuli to accelerate wound repair or prevent infection); however, exposure to sustained stress inhibits immune responses in healthy individuals (Kemeny & Schedlowski, 2007; Segerstrom & Miller, 2004). Although healthy immune systems can compensate for this inhibition, psychosocial stress can have lasting impacts on the immune system (Segerstrom & Miller, 2004). As noted by Kiecolt-Glaser, McGuire, Robles, and Glaser (2002), individual differences in the way one perceives and reacts to the same event, has the ability to provoke different endocrine and immune responses.

Maladaptive neuroendocrine responses to stress in the hypothalamic-pituitary-adrenal axis (HPA) and Sympathetic Nervous System (SNS), can increase the risk for the development or progression of chronic, inflammatory autoimmune diseases. In MS, there is a disruption in communication between the peripheral immune system and the HPA and SNS. While the etiology of MS remains unclear, evidence has suggested critical life events are associated with onset and exacerbations in individuals with MS (Kemeny & Schedlowski, 2007). Additionally, in those with chronic illness, proinflammatory cytokines lead to the development of inflammation. Inflammation itself may then lead to depression, in part accounting (along with psychosocial risk factors) for the increased risk of depression in those who have chronic illness (Dantzer, O'Connor, Freund, Johnson, & Kelley, 2008).

In terms of potential psychosocial correlates of health outcomes, perceived social support has been shown to be a powerful predictor (Pietromonaco et al., 2013; Uchino, 2013). Reviews by Uchino et al. (2012) and Uchino (2013) indicate that increased social support significantly decreases mortality from cancer or infectious disease and that those

who lack support have higher rates of mortality, particularly from cardiovascular disease. Holt-Lunstad, Smith, and Layton (2010) conducted a meta-analysis of 148 studies (308,849 individuals followed for an average of 7.5 years) and found that experiences in social relationships significantly predicted all-cause mortality; those with adequate social relationships had a 50% greater likelihood of survival. The magnitude of the effect was comparable to well-established risk factors (e.g., smoking) and exceeded the effects of other potential factors (e.g., obesity, physical inactivity). The effect was consistent across a number of demographic factors, and as stated by Holt-Lunstad et al. (2010), underscores the need to consider the impact of social relationships on health outcomes in adults.

According to Uchino (2013), relationships may be characterized by positive and negative aspects, which can exert differing effects on health outcomes. A shortcoming of many studies has been to examine social support without examining both aspects, particularly because social negativity has been associated with more negative health outcomes (Brooks & Dunkel Schetter, 2011; Uchino, 2013). Furthermore, evidence has shown that close relationships that are stressful may lead to immune dysregulation (Kiecolt et al., 2002). According to Uchino, ambivalent ties may be particularly problematic. Ambivalent relationships are characterized by both positive and negative exchanges (Rook, Luong, Sorkin, Newsom, & Krause, 2012).

Rook et al. (2012) examined the impact of ambivalent versus exclusively problematic social ties (i.e., comprised of negative exchanges only) on physical and psychological health and interpersonal coping, in an elderly sample. They found that ambivalent ties were linked to greater functional health limitations and exclusively

problematic ties to psychological health. They also found negative exchanges within problematic relationships were associated with more avoidant coping and stronger/more long-lasting negative emotion. In their review, Kiecolt et al. (2002) noted that personality and coping styles including repression, rejection sensitivity, attributional style, and sociability have been associated with altered leukocyte count in peripheral blood and dysregulated cellular immune function.

In a study that included 116 married couples who completed self-report measures assessing attachment, health, social support, relationship satisfaction, and neuroticism, Stanton and Campbell (2014) found that social support moderated the link between attachment and health. Specifically, anxiously attached individuals did not benefit from high levels of social support; that is, social support did not improve their health outcomes, whereas those who were less anxious did benefit from greater social support. This led Stanton and Campbell (2014) to conclude that for those who are anxiously attached, the mechanisms underlying attachment and health are physiological (e.g., immune system dysregulation). They advocated research that explores possible physiological mechanisms that may help explain the relationship between attachment anxiety and health, as well as how and when social support does/does not assist in achieving better health outcomes.

Despite decades of robust and compelling evidence linking psychosocial factors, including social support, to health outcomes, researchers are still calling for empirical research that explores both the positive and negative aspects of support (Uchino, 2013) and the ways in which psychosocial factors are linked to health outcomes (Brooks & Dunkel Schetter, 2011; Pietromonaco et al., 2013; Uchino, 2013).

**Potential Correlates of Psychological Health Outcomes.** Results from the 2016 Canadian Community Mental Health Survey (Statistics Canada, 2017) show that 2.6 million Canadians (8.4 %; aged 12 and over) were diagnosed with a mood disorder in 2016. Viner et al. (2014) explored the point prevalence of depression in a representative community sample of individuals with MS and reported an overall prevalence of 26%. Most importantly, regardless of the assessment method, the prevalence of depression is three times higher in individuals with MS than in the general population. Furthermore, 8.9% of patients reported suicidal ideation in this sample. Gay, Vrignaud, Garitte, and Meunier (2010) examined demographic, disease related, and psychological factors, in a sample of 115 individuals with MS living at home, to determine predictors of depression. Results indicated that Expanded Disability Status Scale (EDSS) scores (i.e., a tool used to clinically quantify level of disability/impairment in individuals with MS), trait anxiety, alexithymia (i.e., difficulty identifying and describing feelings to others), and satisfaction with social support predicted depression. The direct or indirect effects of anxiety were responsible for more than 40% of the variance, while direct effects of functional impairments (EDSS) accounted for less than 5%.

Furthermore, the 2016 Canadian Community Mental Health Survey (Statistics Canada, 2017) indicated that 8.6 % of Canadians have a diagnosed anxiety disorder. Individuals with MS also appear to have a significantly increased risk of suffering from an anxiety disorder; Korostil and Feinstein (2007) examined demographic and neurological data in a clinical sample of 140 individuals with MS and reported that the lifetime prevalence of any type of anxiety disorder was 35.7%. Those experiencing anxiety were more likely to have comorbid depression, greater self-reported stress, were

more likely to drink to excess, and to have contemplated suicide. The authors noted that the diagnosis was often overlooked in the majority of individuals in the sample and thus, untreated.

Further, Bruce, Hancock, Arnett, and Lynch (2010) found that individuals with MS with current mood or anxiety disorders were nearly five times as likely as patients without psychopathology to exhibit problems adhering to their disease modifying therapies. In a qualitative study of individuals with MS, Gaskill, Foley, Kolzet, and Picone (2010) examined key themes in relation to suicidal ideation, as identified by individuals with MS. One of the key themes was loneliness. Despite compelling evidence linking loneliness to health outcomes (Holt-Lunstad et al., 2010; Segrin & Passalacqua, 2010) there is limited research with regards to loneliness in individuals with MS, Hence, it was included in the present study as a psychological health outcome variable.

**Potential Correlates of Quality of Life.** McCabe, Stokes, and McDonald (2009) investigated coping and quality of life in 383 individuals with MS and 291 individuals from the general population (without a neurological condition or chronic illness) over a two-year period. Those with MS had significantly lower environmental, global, social and spiritual quality of life than those in the control group; they also scored lower on problem solving and social-emotional support coping scales. Further, individuals with MS reported greater psychological quality of life, as well as engaging in greater detachment and focusing on the positive in terms of coping. Additionally, McCabe et al. (2009) noted that individuals with MS increased their level of social-emotional support and global quality of life over time, and those who had reported lower quality of life and coping difficulties improved their quality of life more than other participants. Those with

lower quality of life in all domains, tended to report more change in the social coping scale.

Ryan et al. (2007) examined neuropsychological and psychosocial predictors of three subjective well-being outcomes (i.e., emotional well-being, global life satisfaction, and health-related quality of life) in 74 individuals with MS recruited from an urban clinic. In order to obtain corroborative evidence of participants' functioning, caregivers were included. Ryan et al. obtained objective disease-related indices from medical records and neuropsychological testing. Unawareness of deficit was measured as the discrepancy between patient self-report of functional abilities and a caregiver's report of the patient's abilities. Thirty eight percent of the patients reported clinically significant psychological distress, and 27% indicated substantial disruption in health-related quality of life. Interestingly, only 15% reported that they were moderately or more dissatisfied in terms of global life satisfaction. Ryan et al. (2007) suggested that individuals with MS may experience the greatest toll on emotional distress (due to MS symptoms) during the acute stage of adjustment to the illness, and that persons with MS may adjust to the distress over time. However, the effects of the illness (i.e., severity) continue to take a toll on global life satisfaction and health-related quality of life. Hierarchical regression analyses examined the extent to which neuropsychological functioning, unawareness of deficit, and perceived social support improved prediction of each of the 3 outcomes of subjective well-being. Social support and unawareness of deficit provided unique information in predicting all three aspects of SWB, beyond that accounted for by disease characteristics; both social support and unawareness of deficit were associated with positive well-being outcomes.

A comprehensive study by Yamout et al. (2013), examining predictors of quality of life in 201 individuals with MS recruited from outpatient clinics, indicated that quality of life is predicted not solely by physical disability, but by various demographic, disease and psychosocial factors, including depression and social support. Fatigue, pain, depression, and overall EDSS (MS status) score predicted a lower Physical Health Composite Score, while social support predicted a higher Physical Health Composite Score. Disease course also predicted Physical Health Composite Score; it was highest for relapsing-remitting MS and clinically isolated syndrome and worse for primary progressive MS, as well as those patients on anticholinergic treatment. The Mental Health Composite Score was predicted by fatigue, pain, depression, education years, and social support. Depression and social support were the only factors that predicted all three quality of life scores (based on the MSQOL-54): mental and physical quality of life, and overall quality of life.

### **The Present Study**

The goals of the present study were: 1) to provide a comprehensive psychological profile of individuals with MS; 2) to confirm findings from previous studies indicating that psychological factors are better predictors of positive and negative adjustment outcomes than disease related factors; 3) to expand on these findings by examining the relationships between psychological factors and those factors resulting from the disease process (i.e., disease related and psychological), within an attachment framework, to determine what best predicts positive and negative adjustment outcomes (i.e. quality of life); and, 4) to address gaps and limitations identified in the literature. The proposed links of the model (see figure 1) in the present study were based on theory and elements

of the models proposed by Uchino (2013), Pietromonaco et al. (2013), and Dennison et al. (2009).

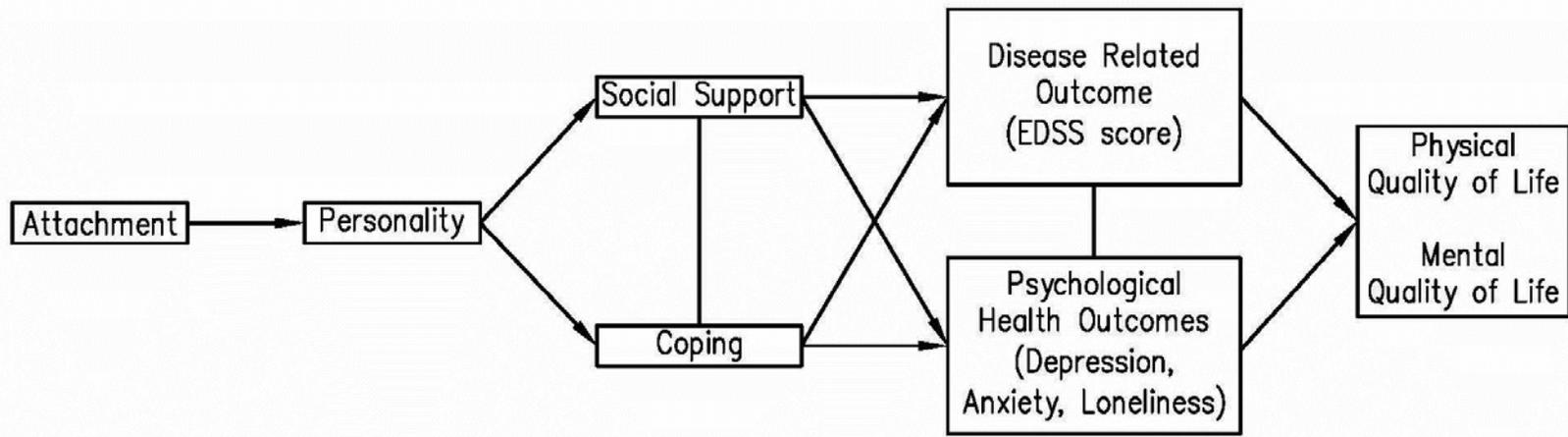


Figure 1. Proposed Model of Relationships Between Psychological Factors and Study Outcomes.

According to Uchino (2013), the links between positive and negative aspects of relationships and physical health are well established; however, relationship and health researchers must work together to begin addressing “second generation” questions. Uchino asserted that in order to address these questions, researchers must investigate: 1) the possible antecedent processes, related to relationship processes, that are relevant to health outcomes, and 2) the coordinated biological pathways linking relationships to health. This is illustrated in a broad model outlined by Uchino, which is meant to facilitate research connecting relationship science and health. In the model, antecedent processes based on relationship science (e.g., attachment, relationship goals, sexuality, interpersonal emotion, and partner knowledge, etc.) are linked to basic relationship processes (e.g., support, negativity, and ambivalence). These relationship processes influence coordinated biological mechanisms (e.g., central neural, cardiovascular, neuroendocrine, and immune function) and physical health outcomes.

Similarly, Pietromonaco et al. (2013) stated that although connections between relationships and health have been well established, less is known about the process through which relationships impact health outcomes; cutting edge research and advances in relationship science have not been incorporated into study design or methodology. These researchers focused on attachment theory in order to develop a theoretical model that integrates relationship processes (i.e., components of attachment theory) with biopsychosocial processes (i.e., health behavior and coping) and health outcomes. The model shows a prototypical dyadic relationship, whereby attachment can shape dyadic processes (e.g. relationship behaviours such as support seeking; relationship mediators

and outcomes such as relationship satisfaction), which can influence each other. Positive and negative dyadic processes (e.g., caregiving and social negativity) are both included as they have been shown to have distinct effects. The model includes pathways through which each partner can influence the other (e.g., Partner A's attachment affects Partner B's relationship mediators and outcomes; Partner B's health and disease outcomes affect Partner A's affect, physiology, and health behaviours). In this theoretical model, Pietromonaco et al. (2013) focused on how attachment and dyadic processes contribute to health relevant processes and outcomes because these have not been elaborated on in the literature. The model emphasizes the value of measuring mediating variables (e.g., relationship mechanisms and physiological processes). While dyadic processes and mediators were not explored in the present study, some of the elements/pathways from this model (i.e., attachment framework, inclusion of disease related, psychological, and health outcomes) were examined.

Lastly, Dennison et al. (2009) conducted a systematic review of psychological correlates of adjustment in individuals with MS; based on the findings, they outlined a working model for successful adjustment and adjustment difficulties in individuals with MS. As noted by Dennison et al. (2009), psychological factors, in addition to being potentially modifiable, are often better predictors than disease related factors of individual differences in adjustment and, thus, they were particularly interested in identifying psychological factors that may be targeted through CBT interventions, noting that these approaches have shown promise in treating depression in individuals with MS. However, according to Dennison et al., CBT trials have given little information about

*which* psychological factors were targeted in interventions and *how* they are related to adjustment outcomes.

In their model (comprised of factors identified in their review), they began with early experiences and personality, which impact key beliefs about the self and others. These beliefs influence goals, values, and behaviors. These are placed in the model as antecedents to “critical events,” including the development of MS, diagnosis, relapse, and disease progression, all of which are related to a disruption in emotional equilibrium and current quality of life. The model then branches off into two areas, successful adjustment and adjustment difficulties; these are comprised of a list of cognitive, behavioural, and social/environmental factors found through the review to be linked to successful or unsuccessful adjustment. Dennison et al. (2009) noted that few of the studies reviewed were based on theoretical models or frameworks.

Goretti et al. (2009) and Yamout et al. (2013) have underlined the need for more comprehensive research. Methodological weaknesses that have been noted in the literature include such issues as: reliance on self-report rather than physician confirmed diagnosis, the use of a single item to measure quality of life rather than validated outcome measures, and accessing community based rather than clinic samples (Kratz, Hirsh, Ehde, & Jensen, 2013). Dennison et al. (2009) identified a number of weaknesses in their review, two of which included small sample size and inadequate reporting of sample medical characteristics (e.g., MS type, disease severity, time since diagnosis, and those experiencing relapse).

Thus, in the present study, the antecedent psychological factors, disease related and psychological health outcomes, and positive and negative adjustment outcomes (i.e.,

quality of life) are laid out in a proposed theoretical model drawn from the above work/models and within the framework of attachment theory. In the model, it was proposed that attachment is linked to personality. Personality is associated with coping, and with social support. Following a diagnosis of MS, social support and coping are both associated with disease related (i.e., EDSS) and psychological (i.e., depression, anxiety, loneliness) health outcomes. Finally, these outcomes are correlated with positive and negative adjustment outcomes (i.e., quality of life). This model is illustrated in Figure 1.

The present study sought to address limitations in the research by recruiting a fairly representative sample of individuals with MS in New Brunswick, with a diagnosis confirmed by a neurologist, to complete a comprehensive questionnaire package assessing demographic information, physical and psychological health, and neuropsychological functioning. The package also included a validated measure of quality of life. Objective measures of disease status and progression (e.g., EDSS) were completed by the MS Resource Nurse following each patient's clinic visit with the neurologist.

### **Research Questions**

1. What are the relationships between psychological factors (i.e., attachment, personality, coping and social support), disease related outcomes (i.e., EDSS), psychological health outcomes (i.e., loneliness, anxiety and depression) and positive and negative adjustment outcomes (i.e., quality of life) as illustrated in Figure 1?
2. In our sample of individuals with MS, which psychological factors (i.e., attachment, personality, coping, social support) predict 1) disease related

outcomes (i.e., EDSS) and 2) psychological health outcomes (i.e., depression, anxiety, and loneliness)?

3. Which factors predict positive and negative adjustment outcomes (i.e., quality of life)? Do disease related and psychological health outcomes add additional predictive value over and above psychological factors? Are psychological factors better predictors of the adjustment outcomes than disease-related factors?
4. If so, what aspects of the psychological factors are predicting positive and negative outcomes?

### **Hypotheses**

1. a) Attachment would be correlated to personality. In turn, personality would be associated with coping, and with social support.

1. b) Following a diagnosis of MS, social support and coping would be linked to each other. Both factors would be associated with disease related (i.e., EDSS) and psychological (i.e., depression, anxiety, and loneliness) health outcomes.

1. c) Both disease related and psychological health outcomes would be linked to each other and correlated with positive and negative adjustment outcomes (i.e., quality of life).

2. Generally speaking, lower attachment security, emotional stability (neuroticism), and extraversion, use of emotion-focused coping strategies and less satisfaction with social support would predict greater depression, anxiety, and loneliness and higher EDSS.

Greater attachment security, emotional stability, higher extraversion and agreeableness, greater perceived support and problem-focused coping would be predictive of less depression, anxiety and loneliness, and lower EDSS. It was hypothesized that

neuroticism, satisfaction with support and emotion-focused coping would emerge as important predictors for these outcomes.

3. Psychological factors (i.e., perceived social support and coping) would be stronger predictors of positive and negative adjustment outcomes than disease related factors (EDSS). Depression would add predictive value.

## **Method**

### **Participants**

Participants were 187 individuals with MS, with a diagnosis of MS confirmed by a neurologist, recruited from the MS Clinic at the Saint John Regional Hospital. The study was open to all patients (between 2010 and 2014) attending the MS Clinic who provided consent to participate. Patients were excluded (as determined by the MS Resource Nurse) if they were unable to provide informed consent or complete the questionnaires based on cognitive impairments. Patients were also excluded if impairments with vision or fine motor skills (e.g., needed to hold a pen and engage in printing/writing) would prevent them completing the questionnaires on their own (i.e., questionnaires included a variety of questions regarding physical and mental health and relationship/sexual functioning).

### **Measures**

The measures in the present study were selected to balance the importance of the characteristics/needs of the sample, with good psychometric properties of the instruments being used for investigation, to achieve as comprehensive and accurate a snapshot as possible into the lives of individuals with MS. As noted by Carver (1997), the inclusion of a large number of measures in a sample from applied settings coupled with the

considerable time and effort required for participation, can sometimes lead to participant response burden. In the current sample, seven additional measures beyond the scope of the current study were also included.

Importantly, some of the physical and psychological characteristics of MS (e.g., fatigue and depression) further necessitated the need to keep the response burden low for our sample. Thus, in some cases, shorter versions of longer measures were used, some of which have been shown to be reliable and valid (e.g., BDI-FS), and balanced with others that are less so (e.g., RQ). Some measures included are contentious but widely used (e.g., EDSS) which, while less than ideal, does have the benefit of making comparisons across studies easier (Meyer-Moock, Maeuer, Dippel, & Kohlmann, 2014). It was determined that if all longer versions were included, items or entire measures would have to be omitted due to response burden. Also, including fewer measures would lead to a less comprehensive picture. The outcome measure of greatest interest, encompassing the physical and mental quality of life of individuals with MS (i.e., MSQOL-54) has been shown to possess good psychometric properties (Vickrey, Hays, Harooni, Myers, & Ellison, 1995).

**Demographic Questionnaire.** A study specific questionnaire was used to determine patients' demographic information (e.g., age, marital status) as well as disease and health status information (e.g., type of MS, current medications for MS, comorbid conditions). The questionnaire consisted of 10 questions and participants were instructed to place an "X" in a Yes or No box or to fill in the appropriate answer (see Appendix A). Included in this were also questions that asked whether they have a close family member or friend with MS, a support network, are currently working, and whether they have

relapsed in the past 30 days. The MS Resource Nurse and research staff at the MS Clinic obtained additional demographic information during the patients' baseline visit; these questions included date of diagnosis and onset of symptoms, type of MS, and EDSS score.

**Relationship Questionnaire.** (RQ; Bartholomew & Horowitz, 1991). The RQ is a single item measure, consisting of four paragraphs that describe prototypical attachment patterns (e.g., Secure, Fearful, Dismissing, and Preoccupied) of close, adult relationships. Participants are asked to rate how well each paragraph describes them on a 7-point scale with statements ranging from “*not at all like me*” to “*very much like me.*” This measure is not intended to be used categorically, and continuous scores provide a profile of an individual's attachment feelings and behaviours. For the purposes of the present study, the measure was worded to ask how individuals generally think and feel in terms of their close relationships. The underlying attachment dimensions of anxiety and avoidance can be calculated from linear combinations of the prototype ratings. To derive the anxiety dimension, the sum of Secure and Dismissing scores are subtracted from the sum of Fearful and Preoccupied scores. Higher scores indicate greater anxiety and more negative models of the self. To calculate the avoidance dimension: the sum of Secure and Preoccupied scores is subtracted from the sum of Fearful and Dismissing scores. Higher scores indicate greater avoidance and more negative models of others.

This brief measure is moderately reliable in comparison to longer, more widely used measures such as the Revised Experiences in Close Relationships (ECR-R; Sibley, Fischer, & Liu, 2005). In a longitudinal study examining psychometric properties of the ECR-R (using the RQ as a benchmark), the authors provided guidelines under which the

RQ may be considered a viable alternative to current measures including: time constraints, survey length, or item repetition (Sibley et al., 2005). As noted by Ravitz, Maunder, Hunter, Sthankiya, and Lancee (2010), the brevity, ease of administration, and face validity of the RQ have led to its widespread use despite the availability of more nuanced measures. Additionally, in their review of attachment measures covering a 25-year period, they discussed considerations in the selection of attachment measures, including “relevance to psychosomatic research.” They noted that reporting about romantic relationships in detail may be off putting to some seriously ill patients who may not see the relevance in the context of their health-related concerns.

**Big Five Inventory.** (BFI; John, Donahue, & Kentle, 1991). The BFI is a 44-item inventory, designed to measure the Big Five Dimensions of Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Participants are asked, on a 5-point rating scale, ranging from “*disagree strongly*” to “*agree strongly*,” to rate their extent of agreement on how well each of the 44 statements describe them. An example of an item is “I see myself as someone who is helpful and unselfish with others.” In their Handbook of Personality chapter, John et al. (2008) reported that in American and Canadian samples, alpha coefficients typically range from .75 to .90, averaging above .80; 3-month test-retest reliabilities have ranged from .80 to .90. John et al. (2008) also reanalyzed DeYoung’s (2006) large community data set to report validity correlations between BFI self reports and peer ratings, and these ranged from .47 for Conscientiousness to .67 for Extraversion. In the current study, internal reliability for the five scales ranged from  $\alpha = .77$  to .83.

**Social Support Questionnaire - Short Form.** (SSQ6; Sarason, Sarason, Shearin, & Pierce, 1987). The SSQ6 is a six-item questionnaire that provides scores for two subscales: 1) Number (i.e., perceived number of supports) and, 2) Satisfaction (i.e., satisfaction with available support). Each item consists of two parts. In the first part, participants are asked to list all the people they know whom they can count on for support in the manner described. They are asked to list the initials of each person as well as their relationship to this person (e.g., father, sister, friend etc.). Part two asks participants to indicate how satisfied they are with the available support using a scale ranging from 6 “*very satisfied*” to 1 “*very dissatisfied*.”

This instrument has been shown to be both reliable and valid (Sarason et al., 1987), with alpha coefficients ranging from .90 to .93 for the Number and Satisfaction subscales. Good internal reliability was shown in the present study as well, with  $\alpha = .93$  for the Number subscale and  $\alpha = .90$  for the Satisfaction subscale. The SSQ6 was evaluated by Sarason et al. (1987), against the full length SSQ, to verify whether correlations with other measures were comparable in order to determine if the SSQ6 was an adequate substitute for the SSQ. It was observed that both the Satisfaction and Number subscales were positively correlated with measures such as perceived social support and negatively correlated with measures such as loneliness, with no significant differences between the SSQ and SSQ6. The authors concluded the SSQ6 is psychometrically sound; they also noted that while the full-length measure is superior, administration of the SSQ6 is an acceptable substitute when time is a consideration in administering the test.

**Brief Coping Orientation to Problem Experiences.** (Brief Cope-28; Carver, 1997). The Brief Cope-28 is an abbreviated form of the full COPE that has been shown to be particularly useful in health research. According to Carver, its purpose is to provide researchers with a way to assess coping responses quickly. Given the difficulty in obtaining samples in applied settings where participants may be experiencing substantial stress, it is intended to help manage item response burden on participants (Carver, 1997). It consists of 14, two-item subscales measuring: Self-distraction, Active coping, Denial, Substance use, Use of emotional support, Use of instrumental support, Behavioral Disengagement, Venting, Positive Reframing, Planning, Humor, Acceptance, Religion, and Self-Blame. Respondents are asked to rate each item on a four-point scale ranging from 1 “*I haven’t been doing this at all*” to 4 “*I’ve been doing this a lot.*” Scores are assessed continuously along each dimension, with higher scores indicating greater use of that particular strategy.

Carver has reported internal consistency as exceeding .6 for all scales, with the exception of venting, denial, and acceptance, all of which were above .5. Results from an exploratory factor analysis indicated a factor structure consistent with that of the full COPE (Carver, 1997). The scales may be combined into several higher order factors; Carver recommends assessing one’s own data to determine the composition of such factors. Litman (2006) noted that across two studies three factors emerged: Self-Sufficient and Socially Supported (generally more positive and adaptive) and Avoidant Coping (considered more negative and less adaptive). Cooper, Katona, and Livingston (2008), in a study looking at 125 people caring for family member with Alzheimer’s, combined the 14 subscales into 3 composite factors: Emotion-focused, Problem-focused,

and Dysfunctional Coping. These participants completed the Brief Cope at three time points over a two-year period. Internal consistencies for the composite scales ranged from .72 to .84. Test retest reliability and convergent and concurrent validity were demonstrated for each of the composite scales. In the present study, scales were combined into the three composite factors identified by Cooper et al. (2008) and internal reliability ranged from  $\alpha = .76$  to .81.

**Expanded Disability Status Scale.** (EDSS; Kurtzke, 1983). The EDSS is a scale designed to quantify disability in MS and monitor changes over time. Scores range from 0 (i.e., *normal neurological exam*) to 10 (i.e., *death due to MS*) and are based on an examination by a neurologist. Steps 1 to 4.5 are defined by patients who can walk without an aid and are based on impairments in 8 functional systems (FS): Pyramidal, Cerebellar, Brainstem, Sensory, Bowel and Bladder, Visual, Cerebral, and Other. Each functional system is scored on a scale ranging from 0 (i.e., *normal*) to 5 or 6 (i.e., *maximal impairment*). For example, Step 1 means “No disability, minimal signs in one FS” while Step 4.5 involves “Significant disability but up and about much of the day, able to work a full day, may otherwise have some limitation of full activity or require minimal assistance. Able to walk without aid or rest for 300m.” Steps 5 to 9.5 are defined by impaired walking. Step 5 consists of “Disability severe enough to impair full daily activities and ability to work a full day without special provisions. Able to walk without aid or rest for 200m” and Step 9.5 means “Confined to bed and totally dependent. Unable to communicate effectively or eat/swallow.”

The EDSS is one of the oldest tools available and identified in many publications as the most widely used instrument to quantify disease outcomes in clinical trials; it has

been validated in numerous studies and is often used as the gold standard reference in checking validity of other instruments (Meyer-Moock et al., 2014). Its weaknesses have been frequently noted, particularly on the basis of its psychometric properties (Hobart, Freeman, & Thompson, 2000). Hobart et al. (2000), however, found the EDSS to address a broader spectrum of disability than other measures, to have adequate inter-rater reliability in group comparison studies, and to discriminate disability from other constructs. Meyer-Moock et al. (2014) noted in their review that intra-rater reliability is slightly higher than inter-rater reliability and that both demonstrate greater variability for lower EDSS scores than higher scores. Hobart et al. (2000) concluded that limitations in psychometric properties of the EDSS call into question its use as an outcome measure in the future. They point to the development of multi-item measures such as the MSQOL-54 by Vickrey et al. (1995), which were developed using psychometric techniques.

**Beck Depression Inventory Fast Screen.** (BDI-FS; Beck, Steer, & Brown, 2000). The BDI-FS is a 7-item self-report questionnaire. It is designed to measure the cognitive and affective symptoms of depression in medical patients while excluding symptoms (e.g., behavioural and somatic) that might be related to medical issues. For each item, participants are presented with groups of statements ranging from 0 (e.g., *not an issue*) to 3 (e.g., *severe*). The statements are related to sadness, pessimism, past failure, loss of pleasure, self-dislike, self-criticalness, and suicide ideation. For example, item one measures sadness (0 = I do not feel sad; 1 = I feel sad much of the time; 2 = I am sad all the time; 3 = I am so sad or unhappy that I can't stand it). For ethical reasons, item 7, containing the group of statements pertaining to suicide ideation was excluded from the present study.

According to Beck et al. (2000), scores of 0 - 3 reflect minimal depression, 4 - 6 mild depression, 7 - 9 moderate depression, and 10 - 21 indicate severe depression. Poole, Bramwell, and Murphy (2009) compared the BDI-FS to the BDI-II in a chronic pain sample. Poole et al. (2009) reported the BDI-FS to have good internal consistency ( $\alpha = .84$ ). Additionally, the BDI-FS showed strong agreement with the BDI-II and the ability to detect clinical change in a chronic pain sample. Poole et al. concluded that the BDI-FS is a good measure for a chronic pain population and may have application in studies where physical symptoms are an issue. They also noted the BDI-FS is less time consuming than the BDI-II and thus less of a burden for those who complete it. In the current study, internal reliability was similar to that reported by Poole et al., with  $\alpha = .86$ .

**State Trait Anxiety Inventory.** (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Form Y (i.e., the current version) of the STAI consists of 20 items measuring state anxiety (e.g., I feel jittery) and 20 items measuring trait anxiety (e.g., I make decisions easily). Participants are asked to read each statement for the questions pertaining to state anxiety, to indicate how they feel *right now, at this moment*, by circling the appropriate number. For the trait anxiety questions, they are asked to do the same but to do so in reference to how they *generally* feel. Responses are rated on a four-point scale, ranging from “*not at all*” to “*very much so*,” with higher scores indicating greater anxiety. Internal consistency estimates for Form Y include a median alpha coefficient of .92 for State Anxiety and .90 for Trait Anxiety. Strong associations (e.g., ranging from .85 to .73) have been found between the two most widely used anxiety measures and the STAI at the time Form X was developed, indicating convergent validity

(Spielberger et al., 1983). In the present study internal reliability was excellent, with  $\alpha = .95$  for State Anxiety and  $\alpha = .94$  for Trait Anxiety.

**Social and Emotional Loneliness Scale for Adults – Short Form.** (SELSA-S; DiTommaso, Brannen, & Best, 2004). The SELSA-S is a 15-item instrument designed to measure loneliness. It consists of 3 subscales, each containing 5 items, which assess social loneliness (e.g., In the last year I felt part of a group of friends), family loneliness (e.g., In the last year there was no one in my family I could depend upon for support and encouragement, but I wish there had been), and romantic loneliness (e.g., In the last year I had an unmet need for a close romantic relationship). Items are rated on a seven-point scale ranging from 1 “*disagree strongly*” to 7 “*agree strongly*” with higher scores indicating greater loneliness. Participants are asked to read each statement and circle the number that best corresponds with their thoughts and feelings during the *past year*.

The SELSA-S has been confirmed as a highly reliable instrument, with alpha coefficients ranging from .87 to .90 (DiTommaso et al., 2004). In the current study internal reliability ranged from  $\alpha = .81$  to .89. Through factor analysis, DiTommaso et al. (2004) confirmed the three-factor structure of loneliness. Concurrent and discriminant validity were demonstrated by evaluating the relationships between the SELSA-S, the original SELSA, and the University of California, Los Angeles, Loneliness Scale-Version 3 (UCLA-3). Scale scores of SELSA-S subscales were most strongly associated with scores on the same scales of SELSA. Statistically significant correlations were found between scores on all SELSA-S scales and scores on the UCLA-3. Further evidence for concurrent and discriminant validity was provided by examining the relationship between

current involvement or non-involvement in a romantic relationship, whereby being involved in one was related to lower scores on the romantic loneliness scale only.

**Multiple Sclerosis Quality of Life – 54.** (MSQOL-54; Vickrey, Hays, Harooni, Myers, & Ellison, 1995). The MSQOL-54 is a multidimensional measure of health-related quality of life combining generic (i.e., non-MS specific) and MS items into one instrument. Vickrey et al. (1995) added 18 MS specific items to the Short-Form 36 item Health Survey (SF-36), an existing and widely used generic measure of quality of life to create the MSQOL-54. The instrument includes 12 subscales (e.g., Physical Function, Role Limitations-Physical, Role Limitations-Emotional, Pain, Emotional Well-Being, Energy, Health Perceptions, Social Function, Cognitive Function, Health Distress, Overall Quality of Life, and Sexual Function) and two single-item measures (e.g., Satisfaction with Sexual Function and Change in Health). Two composite scores (e.g., Physical Health and Mental Health) can be derived from a weighted combination of scale scores. Participants are asked to compare their present health to their health 1 year ago for the item measuring Change in Health Status. For the Physical Function and Overall Quality of Life scales, participants are asked to answer based on how they presently feel. For all other items, participants are asked to answer based on the preceding 4 weeks.

Scale scores are computed by averaging scores within subscales and transforming them linearly into to 0 - 100 range scores, with higher scores reflecting greater quality of life. Thus, for the present study, higher scores on these scales indicate positive adjustment, while lower scores reflect negative adjustment outcomes. Internal reliability estimates for the 12 subscales ranged from .75 to .96 in a sample of 179 individuals with MS and exploratory factor analysis confirmed the underlying dimensions of physical and

mental health. Construct validity was supported by significant associations between the subscales of the MSQOL-54 and degree of MS symptom severity in the past year, current ambulation status, days unable to attend work or school due to MS, hospital admission, and depressive symptoms (Vickrey et al., 1995). In the present study, internal reliability ranged from  $\alpha = .69$  to  $.95$  for the subscales.

### **Procedure**

Data was collected (between 2010 and 2014) from 187 patients of the MS Clinic at the Saint John Regional Hospital, in Saint John, New Brunswick, who participated in a longitudinal study. Individuals who volunteered to participate were told the study would examine a number of psychological factors, as well as objective measures of disease progression, to determine what best predicts quality of life/well-being in individuals with MS. The present study examined variables at Time 1 only. Participants were told that they were free to withdraw at any time. They were offered a parking pass to cover the cost of parking for that day's visit as an incentive. They were instructed not to place any identifying information on any of the materials in order to maintain confidentiality. They were asked to complete and return two questionnaire packages, which included demographic information and questionnaires measuring physical and psychological health, neuropsychological functioning, quality of life and well-being (and additional measures not included in the current study).

Staff conducted assessments during the clinic visit to obtain additional demographics and objective measures of disease status and progression. To address MS related fatigue and privacy concerns, patients were given 14 days to complete the package. They were asked to return the questionnaire packages using a pre-addressed,

stamped envelope that was provided to them. A study number unique to each participant identified the questionnaire packages. Questionnaires were matched to medical files at the MS Clinic using a Participant Master List. Patient files containing returned questionnaire packages and associated materials (i.e., demographics and objective measures obtained from clinic visits) were secured in a locked filing cabinet at the University of New Brunswick, Saint John. This study received ethical approval from the Research Ethics Boards at the University of New Brunswick, Saint John Campus and Horizon Health Network.

## **Results**

### **Data Conditioning**

The data were screened according to techniques outlined in Tabachnick and Fidell (2013) and analyzed in IBM SPSS Statistics 24. To ensure accuracy in the data file, descriptive statistics were examined for out of range values/numbers and plausible means/standard deviations. Missing data was examined to determine how much was missing, and whether there were any non-random patterns that would explain the missing values. According to Tabachnick and Fidell (2013), if 5% or less of the data are missing, in a random pattern, from a large data set, different procedures for handling missing data produce similar results; however, data that is missing not at random (i.e., where the pattern is predictable and related to the variable itself) must be addressed.

A Missing Values Analysis, which highlights patterns of missing values, was conducted through SPSS for variables with 5% or more of the data missing. To preserve power, rather than delete cases with missing data, missing data was addressed within the SPSS syntax editor, when scale scores were computed. The mean was requested for those

who had provided data for at least 80% of the items on each scale. This ensured that those who were missing data on one scale were included in the analyses involving scales for which they had data.

Missing data on the MSQOL-54 was not addressed in this way, as weighted composite scales were used in the analyses. There were issues with the Sexual Health Function Scale; the Missing Values Analysis indicated that between 8.6 and 11.2% of data was missing on the questions comprising this scale. Examination of the completed questionnaires revealed that many participants indicated in writing they did not think that they needed to complete the Sexual Health Function questions because they did not have a relationship partner. Thus, the data was analyzed with the Sexual Health Function Scale included and excluded from the Physical Quality of Life Composite Scale. Results were similar (i.e., descriptives, correlations, final hierarchical regression analysis); thus, the results are reported with the Sexual Health Function Scale included. Sample size was slightly reduced ( $n = 115$  versus  $n = 130$ ) but current analyses permits comparison with other studies.

Additionally, the data was examined for univariate outliers (i.e., cases with an extreme value on one variable). According to Tabachnick and Fidell (2013), cases with standardized scores (z scores) in excess of 3.29 are potential outliers. Z scores were requested for each variable. Univariate outliers were then identified; the outlying cases were given a raw score on the variable [that contained outlier(s)] that was one unit larger or smaller than the next most extreme score in the distribution. The data was then examined for multivariate outliers (i.e., cases with an unusual combination of scores on two or more variables), which can be detected by requesting/interpreting the mahalanobis

distance (i.e., the distance of a case from the centroid of the remaining cases, in which the centroid is the point created at the intersection of the means of all the variables). In the present study, no multivariate outliers were detected.

**Tests for Model Assumptions.** Prior to conducting the analyses, the data was screened to evaluate the assumptions underlying Multiple Regression, specifically normality, linearity, and homoscedasticity (Tabachnick & Fidell, 2013). According to Tabachnick and Fidell, for analyses in which the subjects are ungrouped, the assumption of normality applies to the distributions of the variables or to the residuals (i.e., the “errors” between the predicted and obtained scores) of the analyses. Values of skewness (i.e., symmetry of a distribution) and kurtosis (i.e., peakedness of a distribution) are zero when a distribution is normal. Distributions were evaluated for skewness and kurtosis by examining P-P and Q-Q plots in SPSS.

The assumption of linearity refers to a straight-line relationship between two variables. Linearity was assessed by examining bivariate scatterplots. Homoscedasticity (i.e., the variability in scores at one continuous variable is roughly the same at all values of another continuous variable) is related to normality in that if there is multivariate normality, the distributions will have homoscedasticity. This was inspected by examining scatterplots.

Examination of the distributions (see Tables 2 and 3 for skewness and kurtosis values) and plots indicated there were no serious violations to the assumptions. According to Tabachnick and Fidell, significance tests may be used to evaluate skewness and kurtosis; however, they note that it is also a good idea to examine the shape of the distributions. The values (skewness and kurtosis) and shape of the distribution may be

more useful in larger samples. Additionally, the effects of kurtosis diminish with larger sample sizes; Tabachnick and Fidell reference sample sizes of 100 or more for positive kurtosis and 200 or more for negative kurtosis.

**Multicollinearity.** Finally, multicollinearity (i.e., when two predictors are highly correlated) was assessed by examining the correlations between each of the scales. A correlation of .8 was used as a cutoff value to determine excessive collinearity. The Trait Anxiety subscale of the STAI was strongly correlated with the State Anxiety subscale ( $r = .810, p = .001$ ) and the Depression Total Score ( $r = .789, p = .001$ ). Thus, the Trait Anxiety subscale was omitted from the analyses.

### **Description of the Sample**

Participants consisted of 139 females and 48 males ( $N = 187$ ). The mean age of the females was 48 years ( $SD = 11.42$ ); the mean age of males was 49 years ( $SD = 13.11$ ). The average year of diagnosis for the sample was 1999 ( $SD = 9.02$ ), signifying the presence of long-standing disease. Staff (i.e., MS Resource Nurse) indicated that 62% of participants had relapsing-remitting MS (RRMS), 25% had secondary-progressive MS (SPMS), and 10.3% had primary-progressive MS (PPMS).

The majority of the sample reported either being married (64.7%) or in a common law relationship (10.9%). Further, 60.4% of participants said they were unemployed. Of those who are unemployed, 38.4% said that their employment status was due to MS. A total of 34.4% reported they have family or a friend with MS. It is of note that 31.5% of individuals reported that they *do not* have a support network (see Table 1 for descriptive participant characteristics).

Table 1  
*Characteristics of Sample*

Variable	<i>n</i>	% of Sample
Gender		
Male	48	25.7
Female	139	74.3
MS Type (Identified by Staff)		
Relapsing Remitting MS	114	62.0
Secondary Progressive MS	46	25.0
Primary Progressive MS	19	10.3
Clinically Isolated Syndrome	2	1.1
Benign MS	3	1.6
Marital Status		
Single	32	17.4
Married	119	64.7
Common law	20	10.9
Separated	4	2.2
Widowed	3	1.6
Divorced	6	3.3
Taking Medications for MS		
No	46	25.6
Yes	134	74.4
Support Network		
No	56	31.5
Yes	122	68.5
Any Other Medical Conditions		
No	94	51.6
Yes	88	48.4
Currently Employed		
No	110	60.4
Yes	72	39.6
Reason for Unemployment		
By Choice	16	9.0
Due to MS	68	38.4
Other	22	12.4
Relapse in Past 30 Days		
No	148	82.7
Yes	31	17.3
Attachment Orientation		
Secure	66	36.1
Fearful	32	17.5
Preoccupied	29	15.8
Dismissive	56	30.6

*Note.* *N* = 187.

A total of 74.4% of the sample reported taking specific medications for MS, with the majority reporting they were taking disease-modifying medication (with interferon beta-1a being the most common). Despite this, 17.3% of participants indicated that they had experienced a relapse within the past 30 days. Of interest, 48.4% reported that they had additional medical conditions; of these, 29.5% indicated one or more chronic conditions (i.e., hypertension). Finally, a small proportion of the sample (5.7%) reported one or more psychological conditions, and 3.4% said that, in addition to MS, they had one or more additional chronic health *and* psychological conditions.

Interestingly, 63.9% of the sample selected an insecure attachment pattern as the one that best characterizes how they feel in close relationships (i.e., fearful, preoccupied, or dismissive). A secure attachment pattern was reported by 36.1% of participants as the one that best characterizes how they feel in close relationships, followed by 30.6% selecting dismissing, 17.5% choosing fearful, and 15.8% most identifying with the preoccupied pattern.

**Study Outcome Variables.** Scores varied across participants but were generally similar between males and females (i.e., all within a standard deviation of the means on these variables for the total sample) with respect to the outcome variables (see Table 2 and Table 3 for psychometric properties of study variables).

Table 2

*Psychometric Properties of Predictor Variables*

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	$\alpha$	Range	
							Potential	Actual
EXTRAVERS	183	3.06	.82	-.10	-.29	.80	1 - 5	1 - 5
AGREEABLE	184	4.04	.66	-.64	.07	.83	1 - 5	1.99 - 5
CONSCIENT	183	3.76	.72	-.57	-.24	.83	1 - 5	1.78 - 5
NEUROT	184	3.02	.84	.01	-.57	.83	1 - 5	1 - 4.88
OPENNESS	185	3.33	.63	-.20	.10	.77	1 - 5	1.40 - 4.80
SSQN	175	20.90	12.48	.93	.50	.93	0 - 54	1.98 - 54
SSQS	170	32.36	4.72	-1.72	3.25	.90	6 - 36	15.72 - 36
EFCOPING	185	24.26	5.96	.12	-.21	.78	10 - 40	10 - 40
PFCOPING	185	14.55	3.74	.04	-.30	.76	6 - 24	6 - 24
DYSCOPING	185	20.60	5.97	.78	.16	.81	12 - 48	12 - 39.96

Note. EXTRAVERS = Extraversion subscale of Big Five Inventory; AGREEABLE = Agreeableness subscale of Big Five Inventory; CONSCIENT = Conscientiousness subscale of Big Five Inventory; NEUROT = Neuroticism subscale of Big Five Inventory; OPENNESS = Openness subscale of Big Five Inventory; SSQN = Number subscale of Social Support Questionnaire - Short Form; SSQS = Satisfaction subscale of Social Support Questionnaire - Short Form; EFCOPING = Emotion-focused Coping Composite of the Brief Coping Orientation to Problem Experiences; PFCOPING = Problem-focused Coping Composite of the Brief Coping Orientation to Problem Experiences; DYSCOPING = Dysfunctional Coping Composite of the Brief Coping Orientation to Problem Experiences.

Table 3  
*Psychometric Properties of Outcome Variables*

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	$\alpha$	Range	
							Potential	Actual
EDSS	185	2.53	2.11	1.19	.10		0 - 10	0 - 8
BDIFSTOT	182	3.77	3.66	1.08	.69	.86	0 - 18	0 - 15.6
SANX	184	37.93	12.49	.41	-.44	.95	20 - 80	20 - 72
TANX	182	40.94	12.18	.35	-.65	.94	20 - 80	20 - 73
ROMSEL	183	14.98	8.23	.56	-.58	.81	5 - 35	5 - 35
FAMSEL	186	10.68	6.41	1.14	.35	.89	5 - 35	5 - 30
SOSCEL	185	13.83	7.16	.76	-.13	.85	5 - 35	5 - 35
PHYSCOMP	138	57.04	20.83	-.08	-1.02		0 - 100	13.13 – 94.83
MENTCOMP	165	67.25	20.74	-.66	-.65		0 - 100	16.14 – 98.84

Note. Cronbach's Alpha could not be calculated for the EDSS. PHYSCOMP and MENTCOMP are weighted composite scores; however,  $\alpha$  was calculated for each of the subscales comprising the composites and ranged from .69 to .95. EDSS = Expanded Disability Status Scale Score; BDIFSTOT = Total Score for Beck Depression Inventory Fast Screen; SANX = State Anxiety Subscale of State Trait Anxiety Inventory; TANX = Trait Anxiety Subscale of State Trait Anxiety Inventory; ROMSEL = Romantic Loneliness Subscale of Social and Emotional Loneliness Scale for Adults Short Form; FAMSEL = Family Loneliness Subscale of Social and Emotional Loneliness Scale for Adults Short Form; SOSCEL = Social Loneliness Subscale of Social and Emotional Loneliness Scale for Adults Short Form; PHYSCOMP = Physical Health Composite Score of the Multiple Sclerosis Quality of Life – 54; MENTCOMP = Mental Health Composite Score of the Multiple Sclerosis Quality of Life – 54.

The mean EDSS score for the sample was 2.5 ( $SD = 2.11$ ); the mean EDSS score for males was 2.64 ( $SD = 2.17$ ) and was 2.50 ( $SD = 2.10$ ) for females. Thirty-three participants (17.9% of the sample), however, had an EDSS score  $\geq 6$  [a score of 6 on the EDSS specifies that intermittent or unilateral constant assistance (i.e., cane, crutch, or brace) is required to walk about 100 meters with or without resting]. The average score for the present sample was comparable to scores reported in a quantitative review by Dalton and Heinrichs (2005). They reported a mean EDSS score of 3.1 ( $SD = 1.3$ ) for studies comparing depression scores of individuals with MS to healthy controls, and a mean EDSS score of 3.0 ( $SD = 1.9$ ) for studies comparing depression scores of individuals with MS to those with other chronic diseases.

The mean score for Depression (BDI-FS) was 3.77 ( $SD = 3.66$ ), with males scoring 3.89 ( $SD = 3.64$ ) and females scoring 3.73 ( $SD = 3.68$ ); however, 44.4% of participants had a score of 4 or greater (i.e., 4 is the cut off score for mild depression as reported by Beck et al, 2000). Of those who scored 4 or higher, 18 participants (9.8 %) met the criteria for severe depression (i.e., a score above 10, as identified by Beck et al., 2000). Depression scores for the current sample were similar to a sample of 54 individuals with MS examined by Benedict, Fishman, McClellan, Bakshi, and Weinstock-Guttman (2003); Benedict et al. reported a mean of 3.6 ( $SD = 3.4$ ) on the BDI-FS for the overall group.

The mean score for State Anxiety in the sample was 37.93 ( $SD = 12.49$ ); the mean for males was 38.95 ( $SD = 12.11$ ) and was 37.58 ( $SD = 12.64$ ) for females. For State Anxiety, on average, the current sample did not differ (i.e., was within one SD of the mean) from samples of working adults (Spielberger et al., 1983). Spielberger et al.

published norms for State Anxiety in male and female working adults: the mean for males was 35.72 ( $SD = 10.40$ ), and the mean for females was 35.20 ( $SD = 10.61$ ).

The mean scores for the three types of loneliness (SELSA-S) for the overall sample and for males and females, respectively, were as follows. The mean for Romantic Loneliness was 14.98 ( $SD = 8.23$ ); the mean for males was 14.81 ( $SD = 7.18$ ) and was 15.04 ( $SD = 8.60$ ) for females. For Family Loneliness, the mean was 10.68 ( $SD = 6.41$ ); the mean was 11.15 ( $SD = 6.70$ ) for males and 10.51 ( $SD = 6.32$ ) for females. For Social Loneliness, the mean was 13.83 ( $SD = 7.16$ ); the mean was 15.22 ( $SD = 7.10$ ) for males and 13.36 ( $SD = 7.14$ ) for females. These scores were slightly lower but comparable to those reported by DiTommaso et al. (2004). DiTommaso et al. reported scores for four different samples (i.e., two samples of university students, a female sample of spouses/partners of Canadian military personnel, and a psychiatric sample), as well as overall for each of the three types of loneliness. The overall scores were as follows: Romantic Loneliness ( $M = 16.0$ ;  $SD = 9.1$ ), Family Loneliness ( $M = 13.0$ ;  $SD = 7.6$ ), and Social Loneliness ( $M = 14.8$ ;  $SD = 8.3$ ). Hence, the means on the SELSA-S in the current study are comparable to those obtained with other sample populations.

The mean for the Physical Health Composite score was 57.04 ( $SD = 20.83$ ); the mean was 56.37 ( $SD = 23.58$ ) for males and 57.32 ( $SD = 19.68$ ) for females. The mean Mental Health Composite score was 67.25 ( $SD = 20.74$ ); the mean for males was 66.08 ( $SD = 21.59$ ) and 73.36 ( $SD = 20.54$ ) for females. These scores were also comparable to those reported by Vickrey et al. (1995); they reported a mean Physical Health Composite score of 48.6 ( $SD = 20.3$ ) and a mean Mental Health Composite score of 62.9 ( $SD = 20.7$ ). In the current study, the mean for the Overall Quality of Life subscale was 65.19

( $SD = 18.99$ ); this was comparable to scores reported by Vickrey et al. ( $M = 60.1$ ;  $SD = 20.1$ ).

### **Hypothesis Testing**

Pearson Product Moment Correlations were conducted to examine the relationships between psychological factors, disease related and psychological health outcomes, as well as positive and negative adjustment outcomes (see Table 4). All relationships were small to moderate. A series of hierarchical regressions were then performed to determine which scales or subscales predicted disease related, psychological health, and adjustment outcomes.

Table 4

*Correlations Between Psychological Factors and Study Outcomes*

Measure	EDSS	BDIFSTOT	SANX	TANX	ROMSEL	FAMSEL	SOSCEL	PHYSCOMP	MENTCOMP
RQ1	-.83	-.36**	-.22**	-.38**	-.18*	-.35**	-.38**	.21*	.36**
RQ2	.13	.47**	.27**	.50**	.28**	.31**	.33**	-.24**	-.47**
RQ3	.18*	.34**	.23**	.34**	.30**	.30**	.30**	-.18*	-.36**
RQ4	.13	-.10	-.11	-.07	.07	-.02	-.01	-.03	.04
EXTRAVERS	-.15*	-.36**	-.24**	-.37**	-.16*	-.21**	-.30**	.24**	.26**
AGREEABLE	.09	-.36**	-.31**	-.41**	-.18*	-.35**	-.36**	.08	.35**
CONSCIENT	-.12	-.38**	-.36**	-.44**	-.22**	-.23**	-.21**	.26**	.35**
NEUROT	.01	.60**	.61**	.74**	.26**	.38**	.34**	-.39**	-.63**
OPENNESS	.05	-.08	-.11	-.14	-.17*	-.04	-.05	-.01	.05
SSQN	-.13	-.21*	-.27**	-.20**	-.21**	-.34**	-.37**	.21*	.24**
SSQS	.02	-.48**	-.42**	-.46**	-.33**	-.64**	-.47**	.35**	.43**
EFCOPING	.02	-.02	-.03	.01	-.11	-.11	-.14	-.12	-.03
PFCOPING	.03	-.01	.05	.05	-.14	-.04	-.12	-.17*	.02
DYSCOPING	.06	.75**	.55**	.74**	.20**	.43**	.43**	-.56**	-.75**
EDSS	-	.07	-.08	-.01	.15*	-.01	.09	-.48**	-.08
BDIFSTOT		-	.63**	.79**	.26**	.49**	.53**	-.62**	-.78**
SANX			-	.81**	.20**	.48**	.41**	-.55**	-.69**
TANX				-	.36**	.57**	.52**	-.59**	-.84**
ROMSEL					-	.43**	.29**	-.21*	-.30**
FAMSEL						-	.56**	-.37**	-.55**
SOSCEL							-	-.31**	-.47**
PHYSCOMP								-	.71**
MENTCOMP									-

(continued)

Table 4 (continued)

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*Note.* RQ1 = Secure Attachment Category on Relationship Questionnaire; RQ2 = Fearful Category on Relationship Questionnaire, RQ3 = Preoccupied Category on Relationship Questionnaire, RQ4 = Dismissive Category on Relationship Questionnaire; EXTRAVERS = Extraversion subscale of Big Five Inventory; AGREEABLE = Agreeableness subscale of Big Five Inventory; CONSCIENT = Conscientiousness subscale of Big Five Inventory; NEUROT = Neuroticism subscale of Big Five Inventory; OPENNESS = Openness subscale of Big Five Inventory; SSQN = Number subscale of Social Support Questionnaire - Short Form; SSQS = Satisfaction subscale of Social Support Questionnaire - Short Form; EFCOPING = Emotion-focused Coping Composite of the Brief Coping Orientation to Problem Experiences; PFCOPING = Problem-focused Coping Composite of the Brief Coping Orientation to Problem Experiences; DYSCOPING = Dysfunctional Coping Composite of the Brief Coping Orientation to Problem Experiences. EDSS = Expanded Disability Status Scale Score; BDIFSTOT = Total Score for Beck Depression Inventory Fast Screen; SANX = State Anxiety Subscale of State Trait Anxiety Inventory; TANX = Trait Anxiety Subscale of State Trait Anxiety Inventory; ROMSEL = Romantic Loneliness Subscale of Social and Emotional Loneliness Scale for Adults Short Form; FAMSEL = Family Loneliness Subscale of Social and Emotional Loneliness Scale for Adults Short Form; SOSCEL = Social Loneliness Subscale of Social and Emotional Loneliness Scale for Adults Short Form; PHYSCOMP = Physical Health Composite Score of the Multiple Sclerosis Quality of Life – 54; MENTCOMP = Mental Health Composite Score of the Multiple Sclerosis Quality of Life – 54.

\* $p < .05$ ; \*\* $p < .01$

**Correlations.** A correlational model was proposed broadly linking the psychological factors, disease related and psychological health outcomes, as well as the adjustment outcomes in the study (see Figure 1). In essence (as discussed in the Present Study section), the proposed model was based on theory and the models outlined by Uchino (2013), Pietromonaco et al. (2013), and Dennison et al. (2009); it was applied to individuals with MS in the present study. For the correlations, hypotheses were kept general (i.e., it was proposed that factors would be linked according to the way they were laid out in the model). Figure 2 shows what emerged (i.e., whether and how the factors were linked). Each section of the model that emerged (see Figure 2) is discussed below.

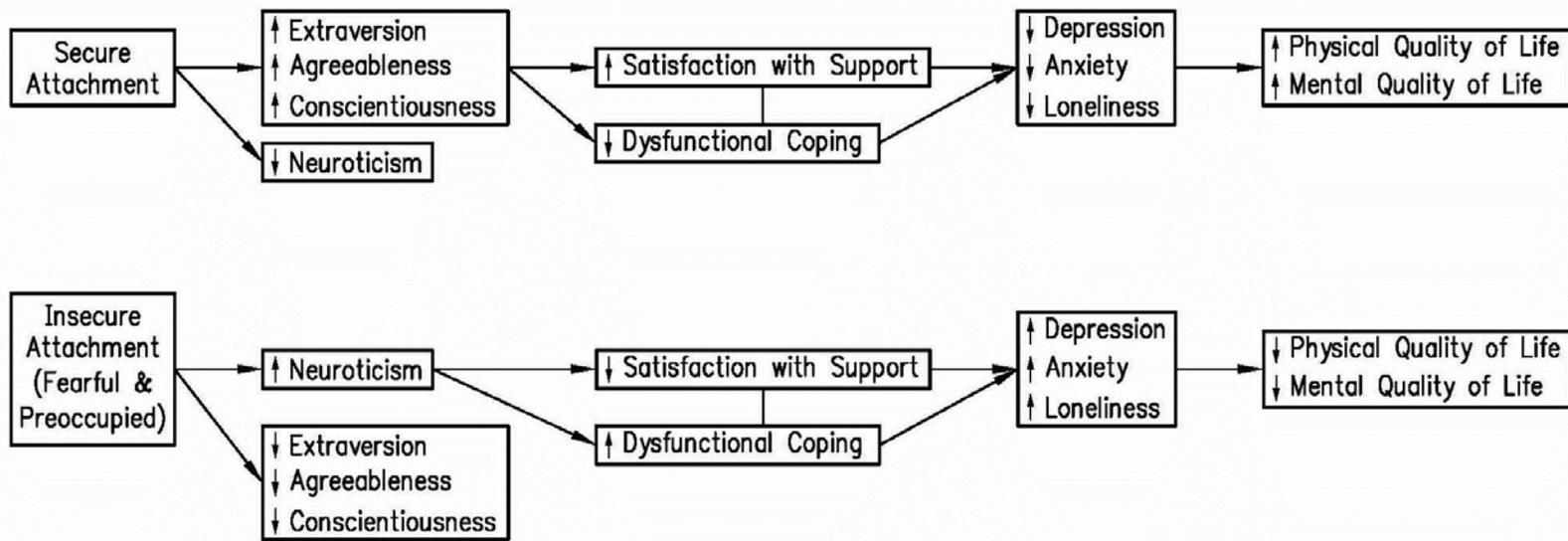


Figure 2. Model that Emerged of Relationships Between Psychological Factors and Study Outcomes.

***Attachment and Personality.*** As illustrated in the first part of the proposed model (see Figure 1), it was hypothesized that attachment would be linked to personality. Results indicated that there were significant associations between three of the RQ attachment patterns and several of the subscales of the BFI (see Figure 2). Specifically, Secure Attachment was associated with higher scores on Extraversion ( $r = .43, p = .001$ ), Agreeableness ( $r = .30, p = .001$ ), and Conscientiousness ( $r = .26, p = .001$ ), and with lower scores on Neuroticism ( $r = -.27, p = .001$ ). Conversely, the analyses showed a different pattern in the first part of the correlational model when insecure attachment (Fearful and Preoccupied Attachment only) was considered. Fearful and Preoccupied Attachment were both associated with lower scores on Extraversion ( $r = -.33, p = .001$  and  $-.16, p = .030$ , respectively), Agreeableness ( $r = -.44, p = .001$  and  $-.18, p = .015$ , respectively), and Conscientiousness ( $r = -.29$  and  $-.26, p = .001$ ), as well as greater Neuroticism ( $r = .32$  and  $.31, p = .001$ ). Dismissing Attachment, however, was not significantly associated with any of the personality variables.

***Personality, Social Support, and Coping.*** In the next part of the model, it was hypothesized that personality would be associated with social support and coping. Analyses revealed that there were significant correlations between the subscales of the BFI, the SSQ6, and the Brief COPE-28. For the proposed link between personality and social support, results indicated that higher scores on Extraversion and Agreeableness were correlated with higher scores on the Number of social supports subscale of the SSQ6 ( $r_s = .27$  and  $.20, p = .001$ , respectively). Further, Extraversion, Agreeableness, and Conscientiousness were associated with higher scores on the Satisfaction with support

subscale ( $r_s = .27, .38, \text{ and } .30, p = .001$ , respectively). Additionally, Neuroticism was associated with lower scores on the Number ( $r = -.17, p = .026$ ) and Satisfaction ( $r = -.26, p = .001$ ) subscales. Openness was correlated with greater Satisfaction with social support ( $r = .16, p = .043$ ).

For the proposed link between personality and coping, analyses revealed that Extraversion, Agreeableness, and Conscientiousness were associated with lower scores on Dysfunctional Coping ( $r = -.18, p = .016$ ;  $r_s = -.36 \text{ and } -.31, p = .001$ , respectively). Neuroticism was correlated with higher scores on Dysfunctional Coping ( $r = .54, p = .001$ ). Openness was the only personality variable that was significantly associated with greater Emotion-focused ( $r = .24, p = .001$ ) and Problem-focused Coping ( $r = .23, p = .002$ ).

Additionally, it was hypothesized that following a diagnosis of MS, social support and coping would be positively correlated. Significant correlations were noted between the subscales of the SSQ6 and the Brief COPE-28. Results showed that higher scores on the Number of social supports subscale were correlated with higher scores on the Emotion-focused ( $r = .22, p = .004$ ) and Problem-focused subscales of the Brief COPE-28 ( $r = .18, p = .019$ ). Higher scores on the Satisfaction subscale were associated with lower scores on Dysfunctional Coping ( $r = -.36, p = .001$ ).

In turn, it was also hypothesized that both social support and coping would be associated with disease related (i.e., EDSS) and psychological (i.e., depression, anxiety, and loneliness) health outcomes. In the present study, the hypothesized connections between social support and coping and the EDSS score were not supported. For the Number (of supports) subscale,  $r = -.13, p = .087$  and  $r = .02, p = .834$  for the Satisfaction

subscale. For Emotion-focused Coping,  $r = .02, p = .812$ ; additionally,  $r = .03, p = .722$  for Problem-focused Coping, and  $r = .06, p = .414$  for Dysfunctional Coping.

For the proposed links between social support and psychological health outcomes, it was found that higher scores on the Number (of social supports) subscale of the SSQ6 were associated with lower scores on Depression ( $r = -.21, p = .006$ ), State Anxiety ( $r = -.27, p = .001$ ), Romantic Loneliness ( $r = -.21, p = .005$ ), Family Loneliness ( $r = -.34, p = .001$ ), and Social Loneliness ( $r = -.37, p = .001$ ). Higher scores on the Satisfaction subscale were correlated with lower scores on Depression ( $r = -.48, p = .001$ ), State Anxiety ( $r = -.42, p = .001$ ), Romantic Loneliness ( $r = -.33, p = .001$ ), Family Loneliness ( $r = -.64, p = .001$ ), and Social Loneliness ( $r = -.47, p = .001$ ).

For the proposed links between coping and psychological health outcomes, results indicated that higher scores on Dysfunctional Coping were associated with greater Depression ( $r = .75, p = .001$ ), State Anxiety ( $r = .55, p = .001$ ), Romantic Loneliness ( $r = .20, p = .008$ ), Family Loneliness ( $r = .43, p = .001$ ) and Social Loneliness ( $r = .43, p = .001$ ). There were no statistically significant correlations between Emotion-focused or Problem-focused Coping, and the outcome variables.

***Disease Related, Psychological Health, and Adjustment Outcomes.*** Finally, it was hypothesized that both disease related (i.e., EDSS) and psychological health outcomes (i.e., depression, anxiety, and loneliness) would be linked to each other and correlated with positive and negative adjustment outcomes/quality of life (i.e., MSQOL-54 Physical and Mental Health Composite scores). The EDSS score was not significantly correlated with any psychological health outcome variables, other than a small association with Romantic Loneliness ( $r = .15, p = .04$ ).

For the proposed links between disease related and positive and negative adjustment outcomes, a higher EDSS score was associated with a lower Physical Health Composite Score ( $r = -.48, p = .001$ ). The EDSS score was not significantly correlated with the Mental Health Composite Score ( $r = -.08, p = .293$ ).

In terms of the proposed links between psychological health and positive and negative adjustment outcomes, greater Depression and State Anxiety were associated with lower Physical Health Composite Scores ( $r_s = -.62, \text{ and } -.55, p = .001$ ). Higher scores on Romantic Loneliness ( $r = -.21, p = .014$ ), Family Loneliness ( $r = -.37, p = .001$ ), and Social Loneliness were also associated with lower Physical Health Composite Scores. Additionally, higher scores on Depression and State Anxiety ( $r_s = -.78 \text{ and } -.69, p = .001$ ), and Romantic, Family and Social Loneliness ( $r_s = -.30, -.55, \text{ and } -.47, p = .001$ ) were correlated with lower Mental Health Composite scores. The Physical Health and Mental Health Composite scores were positively associated with each other ( $r = .71, p = .001$ ). See Table 4 for all correlations between physical and psychological health outcomes and physical and mental quality of life.

**Hierarchical Regression Analyses.** Hierarchical regressions were used to examine which factors predicted EDSS score, Depression, State Anxiety, Romantic Loneliness, Family Loneliness, and Social Loneliness. The first block in each of the models contained the control variables that were used in all subsequent analyses: age, gender, relapse in past 30 days, disease duration, MS Type, marital status, treatment status (taking medication for their MS), comorbid conditions, and employment status. Psychological factors (i.e., attachment, personality, coping, and social support) were entered in the second block and were included in the regression models if the zero order

correlations were statistically significant at  $p < .01$ . For the EDSS, however, potential predictors were only statistically significant at .05 (i.e., none were significant at the cutoff value of .01). Thus, for this variable only,  $p < .05$  was used as the criterion.

It was predicted that lower attachment security, emotional stability (Neuroticism), Extraversion, satisfaction with social support, and greater Emotion-focused Coping would predict higher EDSS scores and greater loneliness, anxiety, and Depression. Greater attachment security, emotional stability, Extraversion, Agreeableness, satisfaction with support, and Problem-focused Coping were expected to be predictive of lower EDSS scores and less Depression, anxiety, and loneliness. It was hypothesized that Neuroticism, satisfaction with support and Emotion-focused Coping would emerge as important predictors for these outcomes. As hypothesized, Neuroticism and in particular, satisfaction with support did emerge as predictors of these outcomes. As mentioned above, however, there were no statistically significant correlations between Emotion-focused or Problem-focused coping, and the outcome variables. Thus, these were not entered in the regression equations for any of the outcomes. It was Dysfunctional Coping (a composite scale which does include emotion-focused strategies considered to not be helpful) that predicted a number of outcomes. The factors that did emerge as significant predictors for each outcome are detailed below.

***Disease Related Outcome.*** The EDSS score, as stated above, was not correlated significantly (at  $p < .01$ ) with any of the hypothesized predictors; thus, after viewing the correlational analyses, it was not expected that Step 2 (i.e., psychological variables) of the regression model would be statistically significant. Analyses revealed that for Step 1, the control variables accounted for 42% of the variance [ $F(9, 154) = 12.38, p = .001$ ].

The squared semipartial correlations (i.e., which indicate the amount of unique variance that can be attributed to each predictor) showed that disease duration ( $sr^2 = .05$ ), type of MS ( $sr^2 = .08$ ), and being employed ( $sr^2 = .03$ ) uniquely contributed to predicting the EDSS score. None of the psychological predictors entered on Step 2 had a statistically significant effect above and beyond the control variables. See Table 5 for additional information regarding the hierarchical regression analyses of disease related and psychological health outcomes.

Table 5  
*Hierarchical Regression Analyses of Disease Related and Psychological Health Outcomes*

Variables	EDSS $\beta$	BDIFSTOT $\beta$	SANX $\beta$	ROMSEL $\beta$	FAMSEL $\beta$	SOSCEL $\beta$
Step 1						
Age	.10	-.17	-.17	.04	-.08	-.10
Gender	-.11	-.00	-.04	-.03	-.01	-.12
Relapse Disease	.04	.30**	.10	.05	.08	.16
Duration	-.28**	.08	.18	-.08	.12	.06
MS Type	.34**	.14	.03	.17	.03	-.00
Marital Status	-.05	-.05	.10	.03	.03	.17
MS Meds	-.04	.16	.10	.21	.05	.09
Medical Conditions	-.06	.09	.13	.21	.01	-.03
Employment	-.19**	-.21	-.18	-.09	-.24	-.24
$R^2$	.420**	.188**	.126	.123	.065	.128
Step 2						
RQ1		-.03	.11		-.18	-.20
RQ2		.12	.03	.11	.01	-.01
RQ3	-.01	.01	-.04	.08	.14	.15
RQ4						
EXTRAVERS	-.09	-.09	.00		.04	-.09
AGREEABLE		.08	.02		-.07	.05
CONSCIENT		-.05	-.15	-.11	.09	.11
NEUROT		.14	.34**	.08	.14	.06
OPENNESS						
SSQN		.01	-.14	-.09	-.08	-.07
SSQS		-.23**	-.11	-.26**	-.49**	-.22*
EFCOPING						
PFCOPING						
DYSCOPING		.54**	.34**	-.07	.10	.32**
$\Delta R^2$	.007	.568**	.438**	.153**	.478**	.339**
Total $R^2$	.426	.756**	.563**	.277**	.543**	.467**
$n$	164	143	142	143	143	142

(continued)

### Table 5 (continued)

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*Note.* Where no values are entered for a given variable, reflects that the item was not entered into the regression equation. RQ1 = Secure Attachment Category on Relationship Questionnaire; RQ2 = Fearful Category on Relationship Questionnaire, RQ3 = Preoccupied Category on Relationship Questionnaire, RQ4 = Dismissive Category on Relationship Questionnaire; EXTRAVERS = Extraversion subscale of Big Five Inventory; AGREEABLE = Agreeableness subscale of Big Five Inventory; CONSCIENT = Conscientiousness subscale of Big Five Inventory; NEUROT = Neuroticism subscale of Big Five Inventory; OPENNESS = Openness subscale of Big Five Inventory; SSQN = Number subscale of Social Support Questionnaire - Short Form; SSQS = Satisfaction subscale of Social Support Questionnaire - Short Form; EFCOPING = Emotion-focused Coping Composite of the Brief Coping Orientation to Problem Experiences; PFCOPING = Problem-focused Coping Composite of the Brief Coping Orientation to Problem Experiences; DYSCOPING = Dysfunctional Coping Composite of the Brief Coping Orientation to Problem Experiences.

\* $p < .01$ ; \*\* $p < .001$ .

**Depression.** After Step 1, analyses indicated that the control variables significantly predicted Depression scores, accounting for 18.8 % of the variance [ $F(9,123) = 3.42, p = .001$ ]; results further indicated that having relapsed in the past 30 days ( $sr^2 = .08$ ) predicted experiencing higher scores on Depression. After the psychological variables were added on Step 2, results showed that they improved the prediction of depression, accounting for an additional 56.8% of the variance [ $F(10, 123) = 28.57, p = .001$ ]. Specifically, the Satisfaction (with social support) subscale ( $sr^2 = .03$ ) and Dysfunctional Coping uniquely predicted the Depression total score ( $sr^2 = .14$ ). Satisfaction (with support) predicted lower Depression scores, and Dysfunctional Coping predicted higher Depression scores.

**State Anxiety.** None of the control variables were significant in Step 1 of the model for State Anxiety. With the entry of psychological factors on Step 2, the model was significant [ $F(10, 122) = 12.24, p = .001$ ], with these factors accounting for 43.8% of the variance. Results showed that Neuroticism ( $sr^2 = .05$ ) and Dysfunctional Coping ( $sr^2 = .06$ ) were uniquely predictive of State Anxiety, with higher levels of Neuroticism and greater use of Dysfunctional Coping being predictive of greater State Anxiety.

**Romantic Loneliness.** The control variables were not significant in the model for Romantic Loneliness. Step 2 of the model, which included the psychological variables, was significant [ $F(7, 126) = 3.81, p = .001$ ] with these factors accounting for 15.3% of the variance. Results showed that the Satisfaction (with support) subscale uniquely predicted Romantic Loneliness ( $sr^2 = .04$ ). Higher scores on Satisfaction predicted lower scores on Romantic Loneliness.

**Family Loneliness.** After Step 1, in the model for Family Loneliness, the control variables were also not significant. After the entry of the psychological variables, Step 2 was significant [ $F(10, 123) = 12.87, p = .001$ ], with these variables accounting for 47.8% of the variance. Results indicated that the Satisfaction (with support) subscale also uniquely predicted Family Loneliness ( $sr^2 = .14$ ). Higher Satisfaction scores predicted lower scores on Romantic Loneliness.

**Social Loneliness.** Lastly, none of the control variables were significant in the model for Social Loneliness. After the entry of the psychological variables, Step 2 was significant [ $F(10, 122) = 7.76, p = .001$ ], with these variables accounting for 33.9% of the variance. Results revealed that the Satisfaction subscale ( $sr^2 = .03$ ) and Dysfunctional Coping ( $sr^2 = .05$ ) uniquely predicted Social Loneliness. Additionally, results showed that higher Satisfaction scores predicted less Social Loneliness, while greater use of Dysfunctional Coping predicted higher scores on Social Loneliness.

**Quality of Life Outcomes.** The final series of hierarchical regressions was performed to determine, in this sample of individuals with MS, which scales or subscales predicted positive and negative adjustment outcomes (i.e., quality of life). The hierarchical regressions examined what factors predicted each of the following dependent variables: Physical Health Composite Score (i.e., physical quality of life) and Mental Health Composite Score (i.e., mental quality of life).

The first block in the model contained the control variables. Psychological factors (i.e., attachment, personality, coping, and social support) were entered on the second block. Disease related (i.e., EDSS) and psychological health outcomes (i.e., Depression and State Anxiety) were entered on the third. After examining descriptive information for

loneliness (i.e., the means for each subscale did not reveal this sample to be particularly lonely) and noting the smaller sample sizes ( $n$ 's = 115 and 126 in final analyses) for the Physical and Mental Health composites (due to missing data on the individual subscales), it was decided that loneliness would be excluded from the final analyses to help improve model specification and power. All other predictors were included in the regression models if zero order correlations were significant at .01. See Table 4 for correlations between physical and psychological health outcomes and mental and physical quality of life. Additionally, see Table 6 for information regarding the hierarchical regression analyses for physical and mental quality of life.

Table 6  
*Hierarchical Regression Analyses of Physical and Mental Quality of Life Outcomes*

Variables	PHYSCOMP		MENTCOMP	
	$\beta$	<i>sr</i>	$\beta$	<i>sr</i>
Step 1				
Age	-.13	-.09	.11	.07
Gender	.01	.01	.07	.07
Relapse	-.22	-.21	-.28**	-.26**
Disease Duration	-.04	-.03	-.13	-.11
MS Type	-.19	-.15	-.13	-.11
Marital Status	-.00	-.00	.01	.01
MS Meds	-.12	-.10	-.19	-.16
Medical Conditions	-.21	-.20	-.17	-.16
Employment	.27*	.23*	.24	.20
$R^2$		.272**		.210**
Step 2				
RQ1			.07	.05
RQ2	.10	.08	-.07	-.05
RQ3			.02	.02
RQ4				
EXTRAVERS	.04	.03	-.09	-.07
AGREEABLENESS			.01	.00
CONSCIENT	-.01	-.01	.03	.02
NEUROT	-.18	-.12	-.27**	-.17**
OPENNESS				
SSQN			.00	.00
SSQS	.17	.14	.12	.10
EFCOPING				
PFCOPING				
DYSCOPING	-.45**	-.32**	-.52**	-.35**
$\Delta R^2$		.330**		.505**
Step 3				
EDSS	-.38**	-.27**		
BDIFSTOT	-.41**	-.20**	-.33**	-.15**
SANX	-.26**	-.17**	-.23**	-.14**
$\Delta R^2$		.161**		.059**
Total $R^2$		.762**		.774*
<i>n</i>		115		126

(continued)

**Table 6 (continued)**

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*Note.* Where no values are entered for a given variable, reflects that the item was not entered into the regression equation. RQ1 = Secure Attachment Category on Relationship Questionnaire; RQ2 = Fearful Category on Relationship Questionnaire, RQ3 = Preoccupied Category on Relationship Questionnaire, RQ4 = Dismissive Category on Relationship Questionnaire; EXTRAVERS = Extraversion subscale of Big Five Inventory; AGREEABLE = Agreeableness subscale of Big Five Inventory; CONSCIENT = Conscientiousness subscale of Big Five Inventory; NEUROT = Neuroticism subscale of Big Five Inventory; OPENNESS = Openness subscale of Big Five Inventory; SSQN = Number subscale of Social Support Questionnaire - Short Form; SSQS = Satisfaction subscale of Social Support Questionnaire - Short Form; EFCOPING = Emotion-focused Coping Composite of the Brief Coping Orientation to Problem Experiences; PFCOPING = Problem-focused Coping Composite of the Brief Coping Orientation to Problem Experiences; DYSCOPING = Dysfunctional Coping Composite of the Brief Coping Orientation to Problem Experiences; EDSS = Expanded Disability Status Scale Score; BDIFSTOT = Total Score for Beck Depression Inventory Fast Screen; SANX = State Anxiety Subscale of State Trait Anxiety Inventory. \* $p < .01$ ; \*\* $p < .001$ .

It was hypothesized that psychological factors (i.e., satisfaction with social support and coping) would be stronger predictors of positive and negative adjustment outcomes than disease related factors (i.e., EDSS). It was also hypothesized that higher depression scores would add predictive value. The factors that emerged as significant predictors for each outcome are detailed below.

***Physical Quality of Life.*** All three Steps of the model for Physical Health Composite Score were statistically significant. Control variables entered on Step 1 [ $F(9, 105) = 4.35, p = .001$ ], accounted for 27.2% of the variance. Being employed was uniquely predictive of physical quality of life ( $sr^2 = .05$ ). Being employed was predictive of a higher Physical Health Composite Score. The entry of the psychological factors on Step 2 [ $F(6, 99) = 13.66, p = .001$ ], accounted for an additional 33% of the variance. Dysfunctional Coping uniquely predicted the Physical Health Composite Score ( $sr^2 = .10$ ). Results showed greater engagement in Dysfunctional Coping predicted lower Physical Health Composite Scores. After physical and psychological health outcomes (i.e., EDSS score, State Anxiety, and Depression) were entered into the model on Step 3 [ $F(3, 96) = 21.63, p = .001$ ], results showed these factors accounted for an additional 16.1% of the variance. Results revealed that EDSS score ( $sr^2 = .07$ ), State Anxiety ( $sr^2 = .03$ ) and Depression ( $sr^2 = .04$ ) all uniquely predicted the Physical Health Composite Score. Specifically, a higher EDSS score, higher State Anxiety, and a higher Depression score predicted lower Physical Health Composite Scores. The overall model accounted for 76.2% of the variance in Physical Health Composite Score.

***Mental Quality of Life.*** All three steps of the model for Mental Quality of Life were also significant. After control variables were entered on Step 1 [ $F(9, 116) = 3.43, p = .001$ ], results showed that these variables accounted for 21% of the variance. Experiencing a relapse in the past 30 days ( $sr^2 = .07$ ) was uniquely predictive of the Mental Health Composite Score. Results showed that experiencing a relapse was predictive of lower Mental Health Composite Scores. After psychological variables were entered on Step 2 [ $F(10, 106) = 18.76, p = .001$ ], results indicated these accounted for an additional 50.5% of the variance. Specifically, Neuroticism ( $sr^2 = .03$ ) and Dysfunctional Coping ( $sr^2 = .12$ ) uniquely predicted Mental Health Composite Scores. Neuroticism and Dysfunctional Coping both predicted lower Mental Health Composite Scores. After psychological health outcomes (i.e., Depression and State Anxiety) were added on Step 3 [ $F(2, 104) = 13.51, p = .001$ ], these accounted for a small, but additional 5.9% of the variance. Both Depression ( $sr^2 = .02$ ), and State Anxiety ( $sr^2 = .02$ ) uniquely predicted the Mental Health Composite Score. Results showed that higher scores on Depression and State Anxiety predicted lower Mental Health Composite Scores. The overall model accounted for 77.4% of the variance in the Mental Health Composite Score.

### **Discussion**

The present study investigated factors that contribute to disease related, psychological health, and quality of life outcomes in individuals with MS. The primary objectives were to provide a comprehensive psychological profile of individuals with MS, and to identify which factors predict positive and negative adjustment outcomes (i.e., physical and mental quality of life) in individuals with MS. Results suggested that

in addition to effective disease management, individuals with MS might benefit from treatment for modifiable psychological factors. Specific areas to target for intervention, based on each outcome, will be reviewed more extensively in the following section.

### **Sample Characteristics and Scores on Study Outcome Variables**

It should be noted that although the study was open to all patients in the MS clinic, due to exclusion criteria, this sample represents those who were well enough to participate and generalizes to similar others. The sample had nearly three times as many women as men, which is consistent with the literature (Multiple Sclerosis Society of Canada, 2018). Because records were not kept with respect to those who were excluded from the study based on cognitive, vision, and/or fine motor impairments, it is not possible to discuss the gender breakdown of patients meeting the exclusion criteria. According to Bove and Chitnis (2014), although females have a higher risk of developing MS, males are more likely to exhibit a progressive onset of disease, poor recovery after initial exacerbations, more rapid accumulation of disability, and more rapid progression of their disability scores.

Sample characteristics (i.e., demographics, average EDSS score) were similar to those reported in a quantitative review conducted by Dalton and Heinrichs (2005). It is interesting to note that the majority of the sample reported that an insecure attachment pattern (i.e., fearful, preoccupied, or dismissive) best described how they feel in close relationships. This was unexpected as nearly 60% of adults report a secure pattern of attachment (Bakermans-Kranenburg & van IJzendoorn, 2009); however, there is evidence that there is greater attachment insecurity among clinical samples (Bakermans-

Kranenburg & van IJzendoorn, 2009) and greater attachment related avoidance among middle aged and older adults, particularly among women (Chopik & Edelstein, 2014).

Overall, the sample reported reasonable physical and mental health outcomes. The sample, as a whole, did not meet the cutoff value for mild depression (Beck et al., 2000) and levels of State Anxiety were slightly higher, but comparable, to norms for working adults (Spielberger et al., 1983). The present sample also reported similar Physical and Mental Health Composite Scores on the MSQOL-54 as those reported by Yamout et al. (2013), a comprehensive study examining predictors of quality of life in individuals with MS. It is notable that the sample had, on average, been diagnosed with MS for a long period of time which might have impacted results. Ryan et al. (2007) suggested that the greatest toll of MS symptoms may occur soon after diagnosis and that individuals with MS adjust to distress over time.

In spite of the generally positive mental health outcomes, a significant minority of individuals in the present study reported high levels of disease burden, depression, anxiety, and loneliness, and rated their physical and mental quality of life below 20 on a scale ranging from 0 – 100. In keeping with this, 29.5% of the sample stated they had one or more chronic conditions, in addition to MS. This finding is not surprising in the context of data reported by the Public Health Agency of Canada (2016) regarding multiple chronic diseases and geographic location; the percentage of the population with multiple chronic diseases (defined as two or more) in New Brunswick was 21.1%. Additionally, 31.5% of individuals in the current sample reported that they did not have a support network. Thus, some individuals with MS experience a heavy physical and mental toll from their illness and may have additional chronic conditions impacting their

disease and health outcomes. Psychological factors have been implicated in individuals with MS' outcomes in the literature (Yamout et al., 2013), which was also the case in the present study and will be discussed further below.

### **Positive and Negative Adjustment Outcomes in Individuals with MS**

The outcomes of greatest interest in the present study were physical and mental quality of life, as measured by the Physical and Mental Health Composites of the MSQOL-54. Quality of life outcomes have been identified as the outcomes that patients consider to be most important to them (Rothwell et al., 1997). It was hypothesized that psychological factors (i.e., satisfaction with social support and coping) would be stronger predictors of positive and negative adjustment outcomes than disease related factors (i.e., EDSS). It was also hypothesized that higher depression scores would add predictive value. These hypotheses were partially supported.

**Physical Quality of Life.** Results indicated that being employed was associated with higher Physical Health Composite scores. It is not possible to infer directionality, that is whether being employed leads to greater physical quality of life or vice versa, given the design of the present study. Many people in the present study were unemployed (60.4%, with 38.4% stating their unemployment was due to MS). This high number of unemployed is not atypical. According to Yamout et al. (2013), 66.2% of individuals with MS in their sample were unemployed or engaged in low-level employment. Yamout et al. (2013) also found that unemployment correlated with poor overall quality of life.

In keeping with this, Pack, Szirony, Kushner, and Bellaw (2014) found that individuals with MS who were employed tended to rate their levels of quality of life

nearly one third of a standard deviation higher than their unemployed counterparts. Miller and Dishon (2006) also noted that the unemployment rate among their sample of individuals with MS was 41.2%. They found that employed patients with the same EDSS as unemployed participants reported a higher quality of life. Nurses and social workers, specializing in MS, have identified “maintaining biographical continuity” as an unmet need in individuals with MS (Golla, Galushko, Pfaff, & Voltz, 2011). Therefore, it appears that, if possible, it is important for individuals with MS to maintain employment. According to Golla et al. (2011), many patients with MS drop out of professional life and, in doing so, lose structure to their days, their social networks, aspects of identity, and a feeling of acceptance. Pack et al. (2014) have emphasized the need for the provision of quality vocational services to individuals with MS.

Dysfunctional Coping, comprised of unhelpful emotion-focused strategies, also emerged as a predictor of the Physical Health Composite score. Cooper et al. (2008) combined the 14 subscales of the Brief COPE into three composite subscales: Emotion-focused; Problem-focused; and, Dysfunctional Coping. The Emotion-focused composite consisted of the emotional support, humour, positive reframing, and religion scales. The Problem-focused composite consisted of active coping, instrumental support, and planning scales. The Dysfunctional Coping composite included behavioural disengagement, self-denial, self-distraction, self-blame, substance abuse, and venting. In the present study, scales were combined according to Cooper et al. (2008). Using these composites, the current results indicated that Dysfunctional Coping was predictive of more negative outcomes.

Although researchers generally consider problem-focused strategies more adaptive than emotion-focused strategies, Carver, Scheier, & Weintraub (1989) argued that this view might be too simplistic. Even within the two categories, there is diversity; for example, denial and positive reframing of events are considered emotion-focused strategies but may have very different implications for an individual's success in their coping efforts. In developing the COPE, Carver et al. described the scales in terms of whether they were *functional* (emotion or problem-focused) or *dysfunctional* in nature. Coolidge, Segal, Hook, and Stewart (2000), first combined the scales of the COPE into the composites of emotion-focused, problem-focused, and dysfunctional coping. Thus, in the present study, there is a distinction between emotion-focused strategies presumed to be functional or dysfunctional.

In a review of the correlates of adjustment outcomes in individuals with MS, Dennison et al. (2010) noted that across studies, certain types of less adaptive emotion-focused coping strategies (i.e., wishful thinking and escape-avoidance) consistently predicted worse adjustment outcomes, whereas more adaptive emotion-focused (i.e., positive re-appraisal) and problem-focused strategies (i.e., support seeking) led to better outcomes. McGuinn (2007) found that negative emotion-focused coping was predictive of worse health-related quality of life outcomes in individuals with MS. Specifically, negative emotion-focused coping predicted lower levels of emotional well-being, cognitive function, and energy. Negative emotion-focused coping was also predictive of higher levels of health distress and pain, a greater impact on social functioning, and an increased number of role limitations due to physical and emotional problems.

Additionally, higher EDSS scores, Depression, and Anxiety each predicted lower Physical Health Composite scores. In the present study, the average EDSS score fit with findings reported in the literature (Yamout et al., 2013); however, 17.9% of the sample had a score of six or greater, indicating greater disease burden and limited mobility. Yamout et al. (2013) also found that EDSS scores and depression predicted lower Physical Health Composite Scores. Minden et al. (2013) conducted an exploratory study of the mental health status of individuals with MS across the United States and concluded that the unmet need for mental health treatment in those with MS was high; in the year preceding the survey, 59.6% of the sample reported mental health problems and only 46.3% received treatment. There is evidence that psychological interventions in chronically ill and cancer patients may lead to improvements in disease related outcomes (Farver-Vestergaard, Jacobsen, & Zachariae, 2014; Syrjala et al., 2014). Additionally, Bruce et al. (2010) noted that nearly 63% of individuals with MS with a current mood or anxiety disorder, as well as those who scored high on neuroticism, showed variable or poor long-term adherence to disease modifying therapies. Thus, based on the literature and findings from the present study, providing treatment for depression and anxiety may improve disease related outcomes, including physical quality of life.

**Mental Quality of Life.** In the current study, having experienced a relapse in the past 30 days predicted lower Mental Health Composite scores. Healy et al. (2012) found that patients who experienced a recent relapse had significantly worse physical and mental quality of life than those in remission; those who had relapsed showed worse functioning than those in remission *one year later* as well. Having a relapse was also

predictive of greater Depression scores in the present study. Based on our findings, patients could benefit from physicians screening for psychological issues associated with relapsing.

Neuroticism and Dysfunctional Coping also predicted lower Mental Health Composite scores. Zarbo et al. (2016) found that neuroticism explained a large amount of the variance in the mental (and physical) composite score on the 36-Item Short Form Health Survey (SF-36); patients who experienced greater neuroticism tended to have lower mental composite scores. In a longitudinal study with a small sample of individuals with MS, lower neuroticism scores at Time 2 were associated with improved mental quality of life (Wahlig, 2006). McGuinn (2007) found that negative emotion-focused coping was predictive of reduced psychological well-being: lower self-acceptance, personal growth, autonomy, environmental mastery, positive relations with others, and purpose in life.

Neuroticism has been associated with many negative psychological health outcomes across the literature (Kotov, Gamez, Schmidt, & Watson, 2010). Vittengl (2017) described neuroticism as an “emerging target” for prevention and intervention initiatives. In the present study, Dysfunctional Coping was also predictive of greater Depression. Both Neuroticism and Dysfunctional Coping were predictive of higher State Anxiety scores. In a longitudinal study, Vittengl (2017) found that while high neuroticism predicted depression and anxiety over time, physical limitations (e.g., having a chronic illness, impaired functioning), social problems (e.g., less support, more strain), and low socio-economic status (e.g., low education, lower income) each moderated the risks from neuroticism in anxiety and depression. As noted by Vittengl,

targeting these internalizing disorders via interventions that reduce neuroticism may help mitigate the risks of neuroticism on psychological health.

Coping has also been associated with depression and anxiety in individuals with MS (Tan-Kristanto & Kiropoulos, 2015). In a sample of newly diagnosed individuals with MS, Tan-Kristanto and Kiropoulos found that depression was predicted by substance abuse (avoidance coping strategy) and venting (emotion-focused strategy). Anxiety was predicted by denial (avoidance strategy) and humour (emotion-focused strategy). Taken together, findings in the literature and the present study suggest that interventions targeting both neuroticism and dysfunctional coping may improve a number of outcomes in individuals with MS.

Depression and State Anxiety also predicted lower Mental Health Composite scores. Individuals with MS have significantly higher rates of depression (Viner et al., 2014) and anxiety (Korostil & Feinstein, 2007) than the general population. In the present study, although the sample as a whole did not meet the cutoff value for mild depression (Beck et al., 2000) and their reported State Anxiety was slightly higher but comparable to norms for working adults (Spielberger et al., 1983), 44.4% of participants had a score at or above the cutoff value for depression, and 9.8% met the criteria for severe depression. Depression (Goretti et al., 2009; Yamout et al., 2013) and anxiety (Goretti et al., 2009) have been associated with poorer quality of life outcomes in individuals with MS, and the current results suggest that individuals should be screened and receive treatment for these comorbid psychological conditions resulting from or being exacerbated by the disease process.

Based on the current findings, the physical and mental quality of life of individuals with MS could be improved by managing physical aspects of the disease (specifically, disease progression and relapses) and screening for mental health problems resulting from the disease process. Areas to specifically target include: neuroticism, dysfunctional coping, depression, and anxiety. Additionally, encouraging individuals with MS to remain employed may improve quality of life.

In sum, hypotheses were partially confirmed in the two major analyses. Results indicated that for both physical and mental quality of life, psychological factors did emerge as stronger predictors than disease related factors and depression added to the prediction. Satisfaction with social support was not a significant predictor for either outcome, which was unexpected. This may be explained, in part, by sample size/statistical power and/or the instrument used in the present study (which will be discussed in the Limitations section). In Yamout et al.'s (2013) comprehensive study, social support was shown to predict both the Physical and Mental Health Composite scores in individuals with MS. Social support uniquely predicted three subjective well-being outcomes (i.e., emotional well-being, global life satisfaction, and health-related quality of life in Ryan et al.'s (2007) study examining predictors of subjective well-being in individuals with MS. Sparling, Stutts, Sanner, and Eijkholt (2017) noted that regular, in-person social interactions have been associated with greater emotional health in individuals with MS, including greater happiness, less depression and less anxiety. Additionally, social support has been shown to be a powerful predictor of health outcomes, including mortality (Holt-Lunstad et al., 2010; Uchino, 2013). In the present study, satisfaction (with social support) was predictive of depression, which predicted

the quality of life outcomes. Thus, it may be said from the current findings, that although satisfaction with support does not directly predict quality of life, boosting satisfaction with social support, may reduce depression, which in turn may also improve quality of life outcomes.

Although satisfaction with social support predicted lower depression, there were no psychological factors that predicted positive adjustment outcomes (i.e., greater quality of life). Neither emotion-focused, nor problem-focused coping were associated with the outcomes in the present study, so they were not entered into the regression equations. Interestingly, Dennison et al. (2010) noted in their review that the strength of the positive relationships between emotion and problem-focused coping and adjustment outcomes was of a lesser magnitude than findings for less adaptive emotion-focused strategies. Baumeister, Bratslavsky, Finkenauer, and Vohs (2001) presented support for the idea that “bad is stronger than good” (p. 323). That is, negative events, traits, relationships, etc., could have more a powerful impact on outcomes, including health outcomes, than more positive factors. That may, in part, help explain the lack of findings regarding predictors of positive outcomes.

In the present study, attachment did not emerge as a predictor of outcomes. This may be explained by the instrument used to measure attachment in the present study (which will be discussed in the Limitations section). As noted by Pietromonaco et al. (2013), it is also possible that attachment may be conceptualized as a framework and a basis for understanding the connections between interpersonal processes and health outcomes (in that it influences the factors that predict outcomes but does not necessarily have direct effects when these factors are considered). Attachment has been linked with

outcomes in other studies involving individuals with chronic illness. In a sample of 68 individuals with MS, Litke (2007) found that greater attachment avoidance predicted reduced physical quality of life. Results also indicated that higher attachment anxiety predicted decreased mental quality of life and overall quality of life. Further, in a sample of 193 individuals diagnosed with lupus, results of a path analysis revealed that attachment anxiety was negatively related to health-related quality of life (Bennett, Fuertes, Keitel, & Phillips, 2011). Given the limitations of the instrument used in the current study, findings within the literature that have linked attachment and outcomes, and correlational results from the present study which showed that attachment insecurity is related to some of the targets for intervention (i.e., neuroticism), it would be worthwhile to explore the role of attachment and health in future studies with regard to direct and/or indirect effects and to consider its potential role in the clinical setting.

### **Limitations and Future Directions**

Inclusion in the current study was limited to those who were well enough to be complete the questionnaire package. This, combined with the number of analyses needed to address the research questions, may have had an impact on statistical power. For the present study, the sample size was already collected/determined prior to the development of the study. Despite the somewhat smaller sample size, the variables in the present study accounted for a large proportion of the variance (between 27.7 and 77.4%) in study outcome variables, with the exception of the EDSS. Some hypotheses, however, were not supported (e.g., attachment and outcomes, extraversion and outcomes, and social support and quality of life outcomes). It would be useful, therefore, to replicate this study with a larger sample size. Also, given that the sample composition

consisted of those well enough to be included, results can only tell us about these and similar individuals, and possibly not the most unwell, who may be a distinct population with respect to the variables of study. A longitudinal design was employed for the overall study; however, only the Time 1 data was explored in the present analysis. Longitudinal data would be more useful, particularly in exploring causality. The present study also did not examine possible mediators or moderators, which could further highlight areas to target for intervention.

Additionally, to address issues with the questionnaires, to develop a comprehensive but smaller package, and to seek input on what could have made it better/easier for patients to complete the study a pilot study would have been helpful. In order to reduce the level of burden on participants as many also experience disease related fatigue and depression, it was necessary to use brief measures in the present study. However, with a targeted/comprehensive package, it would have been preferable to use an alternative (more in depth, reliable, etc.) measure in some areas, such as attachment (e.g., the Relationship Questionnaire is less reliable and valid than the multi-item, more widely used measures such as the Experiences in Close Relationships-Revised Questionnaire, Sibley et al., 2005). Further, there was a significant amount of missing data on the Sexual Health Function Scale of the MSQOL-54. Jelinek et al. (2016) reported a similar issue, whereby participants did not disclose sexual health data on the MSQOL-54. Participants also indicated in writing on the Social Support Questionnaire-Short Form that they found the questionnaire repetitive and they did not want to list initials for privacy reasons. A pilot study would have circumvented these issues.

With respect to further studies, there were individuals in the present study who were found to have a notably heavy disease burden, comorbid conditions, psychological disorders, and markedly reduced quality of life. There were individuals who rated their physical and mental quality of life below 20 on a scale ranging from 0 – 100. Chronic sorrow may accompany chronic illnesses such as MS (Isaksson, Gunnarson, & Ahlstrom, 2007). Although studying grief was beyond the scope of the present study, it warrants attention. These diseases frequently strike in the most productive years, when individuals are often attempting to start families or pursue educational and career goals. Life is altered in the face of such a diagnosis and a research focus on chronic grief and sorrow would add valuable information. It stands to reason that studies examining factors that might specifically help alleviate the distress faced by these individuals would be beneficial to them and possibly to the health care system, given the significant economic impact MS has on the system (Amankwah et al., 2017).

Additionally, comprehensive studies that include socioeconomic status (examining the role of poverty), environmental factors (collaborative studies with larger centers), and system variables (how the system and poor-quality interactions affect patients), in models containing disease and psychological factors would all be of interest. A dyadic approach, as described by Pietromonaco et al. (2013), whereby both the patient and their partner would be included to examine how they influence each other's respective outcomes would be beneficial. Also, none of the psychological factors entered on step 2 of the regression model predicted the EDSS score. It would be interesting to explore this with future samples. Studies identifying possible predictors of EDSS, in addition to the disease related, demographic factors identified in the present

study (keeping in mind biopsychosocial models of disease) would be useful. Finding ways to include some of those patients who would normally need to be excluded from research based on their impairments (e.g., through use of technology) would be ideal. Hence, the possibilities for future directions in terms of exploring the pathways between psychological factors and those resulting from the disease process in MS are rich and varied.

### **Implications/Recommendations**

The present study comprehensively captured the psychological factors that affect psychological health outcomes of individuals with MS, and the psychological factors and mental health symptoms that affect physical and mental quality of life. The primary contributions of the present study were its comprehensiveness and that it identified specific areas to target for intervention, based on each outcome.

The results indicate a need for enhanced psychological services for some individuals with MS. Based on the findings, it is recommended that along with treating the physical aspects of disease, psychological factors (specifically, dysfunctional coping and neuroticism) and mental health symptoms (specifically, depression and state anxiety) should be taken into account as part of treatment/disease management. Further, if possible, individuals should be encouraged to remain employed. Additional results from the present study (i.e., correlations) indicated that attachment insecurity is related to some of these targets for intervention (i.e., neuroticism). Mikulincer and Shaver (2007) and Swickert (2009) suggested it may not be enough to simply tell patients to seek support: attachment security and personality patterns may have implications for support seeking. Thus, those who are identified as having more insecure attachment

patterns as well as higher levels of neuroticism may benefit from therapies that seek to take these into account and promote support seeking efforts within this context (Mikulincer & Shaver, 2012).

Additionally, barriers to psychological services should be identified and addressed (access, cost, waitlist, stigma) for individuals with MS. It was not formally addressed in the present study, however, at both the outset and the conclusion of the study, the following were identified by the clinic's MS Resource Nurse as barriers to psychological care: access to psychological care specific to patients' needs (e.g., a licensed clinical psychologist rather than a local support group); the limited resources of the local mental health clinic that many patients who lack private insurance are referred to; and, insufficient private health insurance for those who have the ability to seek care privately. Minden et al. (2013) reported a large, unmet need for mental health treatment in individuals with MS. Furthermore, when patients did receive treatment, they reported more positive experiences when receiving it from a mental health professional (rather than a medical doctor) and in their MS Centre (rather than in the community). Golla et al. (2011) noted that when they combined the views of stakeholders, health care professionals, and patients into categories of unmet needs, it underscored the view that in a complex disease such as MS, only a holistic view, with treatments delivered by a multidisciplinary team can lead to appropriate care.

Results from a systematic review looking at symptom changes in individuals with MS who received psychological interventions indicated that the interventions led to improvements in both psychological and physiological outcomes (Pagnini, Bosma, Phillips, & Langer, 2014). Interventions included cognitive-behavioural therapy,

relaxation training, meditation, stress management, and coping skills training. It was found that, overall, psychological treatments reduced symptoms of depression, anxiety, and perceived stress, and led to improvements in well-being and quality of life.

Additionally, Pagnini et al. noted that perceptions of general health improved, and patients obtained higher scores on the physical subscales of quality of life measures following psychological interventions. Specifically, they reported that fatigue, pain, physical vitality, and quality of sleep improved. One study within the review showed that individuals who were involved in an individual stress management program had reductions in brain lesions on MRI, as compared to the control group (Pagnini et al., 2014). Based on their findings, Pagnini et al. emphasized the potential for psychological interventions to enhance the quality of life of individuals with MS by improving both psychological and physical symptomatology.

Amankwah et al. (2017) reported model-based estimates and projections of the health and economic impacts of MS from 2011 to 2031 using Statistics Canada's population based longitudinal, microsimulation model (POHEM-Neurological).

Amankwah et al. concluded that individuals with MS have a reduced life expectancy and experience longer periods of time with poorer health-related quality of life. Results indicated that although the prevalence of MS is expected to increase slightly, the burden on individuals with MS, the health care system, and society is projected to increase significantly. By 2031, total annual health sector costs are expected to reach \$2 billion (Amankwah et al., 2017).

A review, commissioned by the Canadian Psychological Association examining the cost effectiveness of psychological interventions, reported that psychological

interventions can not only be cost effective, they may be more so than pharmacological interventions (Hunsley, 2003). Based on the evidence, Hunsley concluded that psychological interventions can also lead to medical cost offset; across the studies included in the review, patients who received psychological treatments reduced their use of the health care system (this ranged from reductions in inpatient services to different types of outpatient services). Hence, adding psychological interventions to the care of individuals with MS may offset some of the rising health care costs associated with the disease.

### **Conclusion**

Participants in the present study are among the “most well” in the MS clinic, but despite this, there are clinically significant levels of depression and anxiety, and very poor quality of life in some participants, all of which are modifiable. Based on the current findings: satisfaction with social support (i.e., quality not quantity) promotes more positive outcomes (i.e., lower depression scores), while dysfunctional coping promotes more negative outcomes (i.e., greater depression, state anxiety, and social loneliness; reduced physical and mental quality of life). Poor disease control (i.e., experiencing a relapse) is predictive of worse outcomes (i.e., greater depression; reduced mental quality of life). Additionally, a higher EDSS score is predictive of reduced physical quality of life. Being employed is predictive of greater physical quality of life. Given that anxiety and depression are predictive of reduced physical and mental quality of life, it is imperative to target modifiable psychological factors with interventions that may improve quality of life in individuals with MS. Based on the findings of the present study, interventions that target dysfunctional coping, neuroticism, depression, and

anxiety may help improve the physical and mental quality of life in individuals with MS.

Multiple sclerosis powerfully impacts the individual, the health care system, and society (Amankwah et al., 2017). Given that psychological interventions can improve the psychological and physical aspects of disease (Pagnini et al., 2014), have the potential to reduce costs in the health care system (Hunsley, 2003), and can improve quality of life (Pagnini et al., 2014), the outcome patients value most (Rothwell et al., 1997), patients should have access to these interventions. Individuals with MS should receive evidence based and patient centered care for *all* aspects of their illness.

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**Appendix A**  
**Demographics**

## DEMOGRAPHICS

DIRECTIONS: Answer the following questions to the best of your knowledge. Please check each box with an "X" or fill in the appropriate answer.

Participant Initials \_\_\_\_\_ Date \_\_\_\_\_ Study Number \_\_\_\_\_

1. Date of Birth \_\_\_\_\_

2. Marital Status

- Single  
 Married  
 Common Law  
 Separated  
 Divorced  
 Widowed

3. What type of Multiple Sclerosis do you have?

- Clinically Isolated Syndrome  
 Relapsing-Remitting MS (RRMS)  
 Secondary Progressive Multiple Sclerosis  
 Primary Progressive Multiple Sclerosis  
 Benign Multiple Sclerosis

4. Do you take any specific medications for Multiple Sclerosis?  Yes  No

If yes, please specify \_\_\_\_\_

5. Do any of your close family or friends have Multiple Sclerosis?  Yes  No

6. Do you have a support network?  Yes  No

7. Do you belong to any support groups?  Yes  No

If yes, please specify \_\_\_\_\_

8. Do you suffer from any other medical conditions?  Yes  No

If yes, please specify \_\_\_\_\_

9. Are you currently employed?  Yes  No

If no, what is the reason?

By choice

Due to MS

Other: Please

specify: \_\_\_\_\_

10. Have you had a relapse in the last 30 days?  Yes  No

#### DEMOGRAPHICS

(To be completed by Research Staff at Baseline Visit)

Participant Initials \_\_\_\_\_ Date \_\_\_\_\_ Study Number \_\_\_\_\_

1. Gender:  Male  Female

2. Date of Birth: \_\_\_\_\_

3. Date of Multiple Sclerosis Diagnosis \_\_\_\_\_ / \_\_\_\_\_ (MMM/YYYY)

4. Date of onset of Multiple Sclerosis symptoms \_\_\_\_\_ / \_\_\_\_\_ (MMM/YYYY)

5. Multiple Sclerosis Classification

Clinically Isolated Syndrome

Relapsing-Remitting MS (RRMS)

Secondary Progressive Multiple Sclerosis

Primary Progressive Multiple Sclerosis

Benign Multiple Sclerosis

6. EDSS Score: \_\_\_\_\_

**Appendix B**  
**Relationship Questionnaire**



**Appendix C**  
**Big Five Inventory**

**BFI**

Here 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 circle a number next to each statement to indicate the extent to which you agree or disagree with that statement.

	<i>I see myself as someone who...</i>	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
1.	Is talkative.	1	2	3	4	5
2.	Tends to find to find fault with others.	1	2	3	4	5
3.	Does a thorough job.	1	2	3	4	5
4.	Is depressed, blue.	1	2	3	4	5
5.	Is original, comes up with new ideas.	1	2	3	4	5
6.	Is reserved.	1	2	3	4	5
7.	Is helpful and unselfish with others.	1	2	3	4	5
8.	Can be somewhat careless.	1	2	3	4	5
9.	Is relaxed, handles stress well.	1	2	3	4	5
10.	Is curious about many different things.	1	2	3	4	5
11.	Is full of energy.	1	2	3	4	5
12.	Starts quarrels with others.	1	2	3	4	5
13.	Is a reliable worker.	1	2	3	4	5
14.	Can be tense.	1	2	3	4	5
15.	Is ingenious, a deep thinker.	1	2	3	4	5
16.	Generates a lot of enthusiasm.	1	2	3	4	5
17.	Has a forgiving nature.	1	2	3	4	5
18.	Tends to be disorganized.	1	2	3	4	5
19.	Worries a lot.	1	2	3	4	5
20.	Has an active imagination.	1	2	3	4	5
21.	Tends to be quiet.	1	2	3	4	5
22.	Is generally trusting.	1	2	3	4	5
23.	Tends to be lazy.	1	2	3	4	5
24.	Is emotionally stable, not easily upset.	1	2	3	4	5
25.	Is inventive.	1	2	3	4	5

	<i>I see myself as someone who...</i>	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree Strongly
<b>26.</b>	Has an assertive personality.	1	2	3	4	5
<b>27.</b>	Can be cold and aloof	1	2	3	4	5
<b>28.</b>	Perseveres until the task is finished.	1	2	3	4	5
<b>29.</b>	Can be moody.	1	2	3	4	5
<b>30.</b>	Values artistic, aesthetic experiences.	1	2	3	4	5
<b>31.</b>	Is sometimes shy, inhibited.	1	2	3	4	5
<b>32.</b>	Is considerate and kind to almost everyone.	1	2	3	4	5
<b>33.</b>	Does things efficiently.	1	2	3	4	5
<b>34.</b>	Remains calm in tense situations.	1	2	3	4	5
<b>35.</b>	Prefers work that is routine.	1	2	3	4	5
<b>36.</b>	Is outgoing, sociable.	1	2	3	4	5
<b>37.</b>	Is sometimes rude to others.	1	2	3	4	5
<b>38.</b>	Makes plans and follows through with them.	1	2	3	4	5
<b>39.</b>	Gets nervous easily.	1	2	3	4	5
<b>40.</b>	Likes to reflect, play with ideas.	1	2	3	4	5
<b>41.</b>	Has few artistic interests.	1	2	3	4	5
<b>42.</b>	Likes to cooperate with others.	1	2	3	4	5
<b>43.</b>	Is easily distracted.	1	2	3	4	5
<b>44.</b>	Is sophisticated in art, music, or literature.	1	2	3	4	5

**Appendix D**

**Social Support Questionnaire – Short Form**

## SSQ6

### INSTRUCTIONS:

The following questions ask about people in your environment who provide you with help or support. Each question has two parts. For the first part, list all the people you know, excluding yourself, whom you can count on for help or support in the manner described. Give the person's initials, their relationship to you (see example). Do not list more than one person next to each of the numbers beneath the question.

For the second part, circle how satisfied you are with the overall support you have.

If you have had no support for a question, check the words "No one," but still rate your level of satisfaction.

Please answer all the questions as best you can. All your responses will be kept confidential.

### EXAMPLE:

Who do you know whom you can trust with information that could get you in trouble?

No one	1) T.N. (brother)	4) T.N. (father)	7)
	2) L.M. (friend)	5) L.M. (employer)	8)
	3) R.S. (friend)	6)	9)

How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied
-----------------------	-------------------------	---------------------------	------------------------------	----------------------------	--------------------------

1. Whom can you really count on to be dependable when you need help?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

2. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 very dissatisfied
-----------------------	-------------------------	---------------------------	------------------------------	----------------------------	------------------------

3. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

4. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied
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5. Who accepts you totally, including both your worst and your best points?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

6. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied
--------------------	----------------------	------------------------	---------------------------	-------------------------	-----------------------

7. Whom can you really count on to care about you, regardless of what is happening to you?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

8. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied
--------------------	----------------------	------------------------	---------------------------	-------------------------	-----------------------

9. Whom can you really count on to help you feel better when you are feeling generally down-in-the dumps?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

10. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied
--------------------	----------------------	------------------------	---------------------------	-------------------------	-----------------------

11. Whom can you count on to console you when you are very upset?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

12. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied
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**Appendix E**

**Brief Coping Orientation to Problem Experiences**

### Brief Cope - 28

These items deal with ways you've been coping with the stress in your life since you found out you had MS. There are many ways to try to deal with problems. These items ask what you've been doing to cope with it. Each item says something about a particular way of coping. Try to rate each item separately in your mind from others. Make your answers as true **FOR YOU** as you can.

	<i>I've been.....</i>	I haven't been doing this at all	I've been doing this a little bit	I've been doing this a medium amount	I've been doing this a lot
1.	turning to work or other activities to take my mind off things.	1	2	3	4
2.	concentrating my efforts on doing something about the situation I'm in.	1	2	3	4
3.	saying to myself "this isn't real".	1	2	3	4
4.	using alcohol or other drugs to make myself feel better.	1	2	3	4
5.	getting emotional support from others.	1	2	3	4
6.	giving up trying to deal with it.	1	2	3	4
7.	taking action to try to make the situation better.	1	2	3	4
8.	refusing to believe that it has happened.	1	2	3	4
9.	saying things to let my unpleasant feelings escape.	1	2	3	4
10.	getting help and advice from other people.	1	2	3	4
11.	using alcohol or other drugs to help me get through it.	1	2	3	4
12.	trying to see it in a different light, to make it seem more positive.	1	2	3	4
13.	criticizing myself.	1	2	3	4
14.	trying to come up with a strategy about what to do.	1	2	3	4
15.	getting comfort and understanding from someone.	1	2	3	4

	<i>I've been.....</i>	I haven't been doing this at all	I've been doing this a little bit	I've been doing this a medium amount	I've been doing this a lot
<b>16.</b>	giving up the attempt to cope.	1	2	3	4
<b>17.</b>	looking for something good in what is happening	1	2	3	4
<b>18.</b>	making jokes about it.	1	2	3	4
<b>19.</b>	doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.	1	2	3	4
<b>20.</b>	accepting the reality of the fact that it has happened.	1	2	3	4
<b>21.</b>	expressing my negative feelings.	1	2	3	4
<b>22.</b>	trying to find comfort in my religion or spiritual beliefs	1	2	3	4
<b>23.</b>	trying to get advice or help from other people about what to do.	1	2	3	4
<b>24.</b>	learning to live with it.	1	2	3	4
<b>25.</b>	thinking hard about what steps to take.	1	2	3	4
<b>26.</b>	blaming myself for things that happened.	1	2	3	4
<b>27.</b>	praying or meditating.	1	2	3	4
<b>28.</b>	making fun of the situation.	1	2	3	4

**Appendix F**  
**Expanded Disability Status Scale**

### **Expanded Disability Status Scale (EDSS)**

0 = Normal neurologic exam (all grade 0 in Functional Systems [FS]; Cerebral grade 1 acceptable).

1.0 = No disability, minimal signs in one FS (i.e., grade 1 excluding Cerebral grade 1).

1.5 = No disability minimal signs in more than one FS (more than one grade 1 excluding Cerebral grade 1)

2.0 = Minimal disability in one FS (one FS grade 2, others 0 or 1).

2.5 = Minimal disability in two FS (two FS grade 2, others 0 or 1).

3.0 = Moderate disability in one FS (one FS grade 3, others 0 or 1), or mild disability in three or four FS (three/four FS grade 2, others 0 or 1) though fully ambulatory

3.5 = Fully ambulatory but with moderate disability in one FS (one grade 3) and one or two FS grade 2; or two FS grade 3; or five FS grade 2 (others 0 or 1).

4.0 = Fully ambulatory without aid, self-sufficient, up and about some 12 hours a day despite relatively severe disability consisting of one FS grade 4 (others 0 or 1), or combinations of lesser grades exceeding limits of previous steps. Able to walk without aid or rest some 500 meters.

4.5 = Fully ambulatory without aid, up and about much of the day, able to work a full day, may otherwise have some limitation of full activity or require minimal assistance; characterized by relatively severe disability, usually consisting of one FS grade 4 (others 0 or 1) or combinations of lesser grades exceeding limits of previous steps. Able to walk without aid or rest for some 300 meters.

5.0 = Ambulatory without aid or rest for about 200 meters; disability severe enough to impair full daily activities (e.g., to work full day without special provisions). (Usual FS equivalents are one grade 5 alone, others 0 or 1; or combinations of lesser grades usually exceeding specifications for step 4.0).

5.5 = Ambulatory without aid or rest for about 100 meters; disability severe enough to preclude full daily activities. (Usual FS equivalents are one grade 5 alone, others 0 or 1; or combinations of lesser grades usually exceeding those for step 4.0)

6.0 = Intermittent or unilateral constant assistance (cane, crutch, or brace) required to walk about 100 meters with or without resting. (Usual FS equivalents are combinations with more than two FS grade 3+)

6.5 = Constant bilateral assistance (canes, crutches, or braces) required to walk about 20 meters without resting. (Usual FS equivalents are combinations with more than two FS grade 3+)

7.0 = Unable to walk beyond about 5 meters even with aid, essentially restricted to wheelchair; wheels self in standard wheelchair and transfers alone; up and about in w/c some 12 hours a day. (Usual FS equivalents are combinations with more than one FS grade 4+; very rarely, pyramidal grade 5 alone)

7.5 = Unable to take more than a few steps; restricted to wheelchair; may need aid in transfer; wheels self but cannot carry on in standard wheelchair a full day; may require motorized wheelchair. (Usual FS equivalents are combinations with more than one FS grade 4+)

8.0 = Essentially restricted to bed or chair or perambulated in wheelchair but may be out of bed itself much of the day; retains many self-care functions; generally, has effective use of arms. (Usual FS equivalents are combinations, generally grade 4 + in several systems)

8.5 = Essentially restricted to bed much of the day; has some effective use of arm(s); retains some self-care functions. (Usual FS equivalents are combinations, generally 4+ in several systems)

9.0 = Helpless bed patient; can communicate and eat. (Usual FS equivalents are combinations, mostly grade 4+)

9.5 = Totally helpless bed patient; unable to communicate effectively or eat/swallow. (Usual FS equivalents are combinations, almost all grade 4+)

10.0 = Death due to MS.

**Appendix G**

**Beck Depression Inventory Fast Screen**

**BDI- FS**

This questionnaire consists of groups of statements. Please read each group of statements carefully, then pick out the one statement in each group which best describes the way you have been feeling during the past 2 weeks, including today! Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle the statement which has the largest number.

**1.**

- 0** I do not feel sad.
- 1** I feel sad much of the time.
- 2** I am sad all the time.
- 3** I am so sad or unhappy that I can't stand it.

**2.**

- 0** I am not discouraged about the future.
- 1** I feel more discouraged about my future than I used to be.
- 2** I do not expect things to work out for me.
- 3** I feel my future is hopeless and will only get worse.

**3.**

- 0** I do not feel like a failure.
- 1** I have failed more than I should have.
- 2** As I look back, I see a lot of failures.
- 3** I feel I am a total failure as a person.

**4.**

- 0** I get as much pleasure as I ever did from the things I enjoy
- 1** I don't enjoy things as much as I used to.
- 2** I get very little pleasure from the things I used to enjoy.
- 3** I can't get any pleasure from the things I used to enjoy.

**5.**

- 0** I feel the same about myself as ever.
- 1** I have lost confidence in myself.
- 2** I am disappointed in myself.
- 3** I dislike myself.

- 6.
- 0** I don't criticize or blame myself more than usual.
  - 1** I am more critical of myself than I used to be.
  - 2** I criticize myself for all my faults.
  - 3** I blame myself for everything bad that happens.

**Appendix H**  
**State Trait Anxiety Inventory**

### STAI – Y Part 1

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right* now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feeling best.

		Not at all	Somewhat	Moderately so	Very much so
1.	I feel calm.	1	2	3	4
2.	I feel secure.	1	2	3	4
3.	I am tense.	1	2	3	4
4.	I feel strained.	1	2	3	4
5.	I feel at ease.	1	2	3	4
6.	I feel upset.	1	2	3	4
7.	I am presently worrying over possible misfortunes.	1	2	3	4
8.	I feel satisfied.	1	2	3	4
9.	I feel frightened.	1	2	3	4
10.	I feel comfortable.	1	2	3	4
11.	I feel self-confident.	1	2	3	4
12.	I feel nervous.	1	2	3	4
13.	I am jittery.	1	2	3	4
14.	I feel indecisive.	1	2	3	4
15.	I am relaxed.	1	2	3	4
16.	I feel content.	1	2	3	4
17.	I am worried.	1	2	3	4
18.	I feel confused.	1	2	3	4
19.	I feel steady.	1	2	3	4
20.	I feel pleasant.	1	2	3	4

### STAI – Y Part 2

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel.

		Almost never	Sometimes	Often	Almost always
21.	I feel pleasant.	1	2	3	4
22.	I feel nervous and restless.	1	2	3	4
23.	I feel satisfied with myself.	1	2	3	4
24.	I wish I could be as happy as others seem to be.	1	2	3	4
25.	I feel like a failure.	1	2	3	4
26.	I feel rested.	1	2	3	4
27.	I am “calm, cool, and collected.”	1	2	3	4
28.	I feel that difficulties are piling up so that I cannot overcome them.	1	2	3	4
29.	I worry too much over something that really doesn't matter.	1	2	3	4
30.	I am happy.	1	2	3	4
31.	I have disturbing thoughts.	1	2	3	4
32.	I lack self-confidence.	1	2	3	4
33.	I feel secure.	1	2	3	4
34.	I make decisions easily.	1	2	3	4
35.	I feel inadequate.	1	2	3	4
36.	I am content.	1	2	3	4
37.	Some unimportant thought runs through my mind and bothers me.	1	2	3	4
38.	I take disappointments so keenly that I can't put them out of my mind.	1	2	3	4
39.	I am a steady person.	1	2	3	4
40.	I get in a state of tension or turmoil as I think over my recent concerns and interests.	1	2	3	4

**Appendix I**

**Social and Emotional Loneliness Scale for Adults – Short Form**

## SELSA-S

On this page you will find a number of statements that an individual might make about his/her social relationships. Please read these statements carefully and indicate the extent to which you agree or disagree with each one as a statement about you, using the 7-point rating provided to the right of each question.

Please take a moment to think about your relationships with your partner, your family and your friends over the *past year*. Please circle the number that best reflects the degree to which each of the following statements describes your thoughts and feelings during the *PAST YEAR*. Please try to respond to each statement.

***In the past year:***

	Disagree Strongly						Agree Strongly
1. In the last year I felt alone when I was with my family.	1	2	3	4	5	6	7
2. In the last year I felt part of a group of friends.	1	2	3	4	5	6	7
3. In the last year I had a romantic partner with whom I shared my most intimate thoughts and feelings.	1	2	3	4	5	6	7
4. In the last year there was no one in my family I could depend upon for support and encouragement, but I wish there had been.	1	2	3	4	5	6	7
5. In the last year my friends understood my motives and reasoning.	1	2	3	4	5	6	7
6. In the last year I had a romantic or marital partner who gave me the support and encouragement I needed.	1	2	3	4	5	6	7
7. In the last year I didn't have a friend(s) who shared my views, but I wish I had.	1	2	3	4	5	6	7
8. In the last year I felt close to my family.	1	2	3	4	5	6	7
9. In the last year I was able to depend on my friends for help.	1	2	3	4	5	6	7
10. In the last year I wished I had a more satisfying romantic relationship.	1	2	3	4	5	6	7
11. In the last year I felt a part of my family.	1	2	3	4	5	6	7
12. In the last year my family really cared about me.	1	2	3	4	5	6	7
13. In the last year I didn't have a friend(s) who understood me, but I wish I had.	1	2	3	4	5	6	7
14. In the last year I had a romantic partner to whose happiness I contributed.	1	2	3	4	5	6	7
15. In the last year I had an unmet need for a close romantic relationship.	1	2	3	4	5	6	7

**Appendix J**

**Multiple Sclerosis Quality of Life - 54**

### MSQL-54

Instructions: This survey asks about your health and daily activities. Answer every question by circling the appropriate number (1, 2, 3,.....).

*If you are unsure about how to answer a question, please give the best answer you can and write a comment or explanation in the margin.*

		Excellent	Very Good	Good	Fair	Poor
<b>1.</b>	In general, would you say your health is:	1	2	3	4	5

		Much better now than one year ago	Somewhat better now than one year ago	About the same	Somewhat worse now than one year ago	Much worse now than one year ago
<b>2.</b>	<b>Compared to one year ago,</b> how would you rate your health in general now?	1	2	3	4	5

3-12 The following questions are about activities you might do during a typical day. Does **your health** limit you in these activities? If so, how much?

		Yes, limited a lot	Yes, limited a little	No, not limited at all
<b>3.</b>	Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports.	1	2	3
<b>4.</b>	Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.	1	2	3
<b>5.</b>	Lifting or carrying groceries.	1	2	3
<b>6.</b>	Climbing several flights of stairs.	1	2	3
<b>7.</b>	Climbing one flight of stairs.	1	2	3
<b>8.</b>	Bending, kneeling or stooping.	1	2	3
<b>9.</b>	Walking more than a mile.	1	2	3
<b>10.</b>	Walking several blocks.	1	2	3
<b>11.</b>	Walking one block.	1	2	3
<b>12.</b>	Bathing and dressing yourself.	1	2	3

13-16 During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

		Yes	No
<b>13.</b>	Cut down on the amount of time you could spend on work or other activities.	1	2
<b>14.</b>	Accomplished less than you would like.	1	2
<b>15.</b>	Were limited in the kind of work or other activities.	1	2
<b>16.</b>	Had difficulty performing the work or other activities.	1	2

17-19 During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious).

		Yes	No
<b>17.</b>	Cut down on the amount of time you could spend on work or other activities.	1	2
<b>18.</b>	Accomplished less than you would like.	1	2
<b>19.</b>	Didn't do work or other activities as carefully as usual.	1	2

		Not at all	Slightly	Moderately	Quite a bit	Extremely
<b>20.</b>	During the <b>past 4 weeks</b> , to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors or groups?	1	2	3	4	5

		None	Very Mild	Mild	Moderate	Severe	Very Severe
<b>21.</b>	How much <b>bodily</b> pain have you had during the <b>past 4 weeks</b> ?	1	2	3	4	5	6

		Not at all	A little bit	Moderately	Quite a bit	Extremely
<b>22.</b>	During the <b>past 4 weeks</b> , how much did <b>pain</b> interfere with your normal work (including both work outside the home and housework)?	1	2	3	4	5

23-32 These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much time during the **past 4 weeks**....

		All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
<b>23.</b>	Did you feel full of pep?	1	2	3	4	5	6
<b>24.</b>	Have you been a very nervous person?	1	2	3	4	5	6
<b>25.</b>	Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
<b>26.</b>	Have you felt calm and peaceful?	1	2	3	4	5	6
<b>27.</b>	Did you have a lot of energy?	1	2	3	4	5	6
<b>28.</b>	Have you felt downhearted and blue?	1	2	3	4	5	6
<b>29.</b>	Did you feel worn out?	1	2	3	4	5	6
<b>30.</b>	Have you been a happy person?	1	2	3	4	5	6
<b>31.</b>	Did you feel tired?	1	2	3	4	5	6
<b>32.</b>	Did you feel rested on waking in the morning?	1	2	3	4	5	6

		Not at all	Slightly	Moderately	Quite a bit	Extremely
<b>33.</b>	During the <b>past 4 weeks</b> , how much of the time has your <b>physical health or emotional problems</b> interfered with your social activities (like visiting with friends, relatives, etc.)?	1	2	3	4	5

### Health in General

34-37 How TRUE or FALSE is each of the following statements for you.

		Definitely true	Mostly true	Not sure	Mostly false	Definitely false
<b>34.</b>	I seem to get sick a little easier than other people.	1	2	3	4	5
<b>35.</b>	I am as healthy as anybody I know.	1	2	3	4	5
<b>36.</b>	I expect my health to get worse.	1	2	3	4	5
<b>37.</b>	My health is excellent.	1	2	3	4	5

### Health Distress

38-41 How much of the time during the **past 4 weeks....**

		All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
<b>38.</b>	Were you discouraged by your health problems?	1	2	3	4	5	6
<b>39.</b>	Were you frustrated about your health?	1	2	3	4	5	6
<b>40.</b>	Was your health a worry in your life?	1	2	3	4	5	6
<b>41.</b>	Did you feel weighed down by your health problems?	1	2	3	4	5	6

**Cognitive Function**42-45 How much of the time during the **past 4 weeks....**

		All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
<b>42.</b>	Have you had difficulty concentrating and thinking?	1	2	3	4	5	6
<b>43.</b>	Did you have trouble keeping your attention on an activity for long?	1	2	3	4	5	6
<b>44.</b>	Have you had trouble with your memory?	1	2	3	4	5	6
<b>45.</b>	Have others, such as family members or friends, noticed that you have trouble with your memory or problems with your concentration?	1	2	3	4	5	6

**Sexual Function**46-49 The next set of questions are about your sexual function and your satisfaction with your sexual function. Please answer as accurately as possible about your function **during the last 4 weeks only.**How much of a problem was each of the following for you **during the past 4 weeks?**

	<b>MEN</b>	Not a problem	A little of a problem	Somewhat of a problem	Very much a problem
<b>46.</b>	Lack of sexual interest.	1	2	3	4
<b>47.</b>	Difficulty getting or keeping an erection.	1	2	3	4
<b>48.</b>	Difficulty having orgasm.	1	2	3	4
<b>49.</b>	Ability to satisfy sexual partner.	1	2	3	4

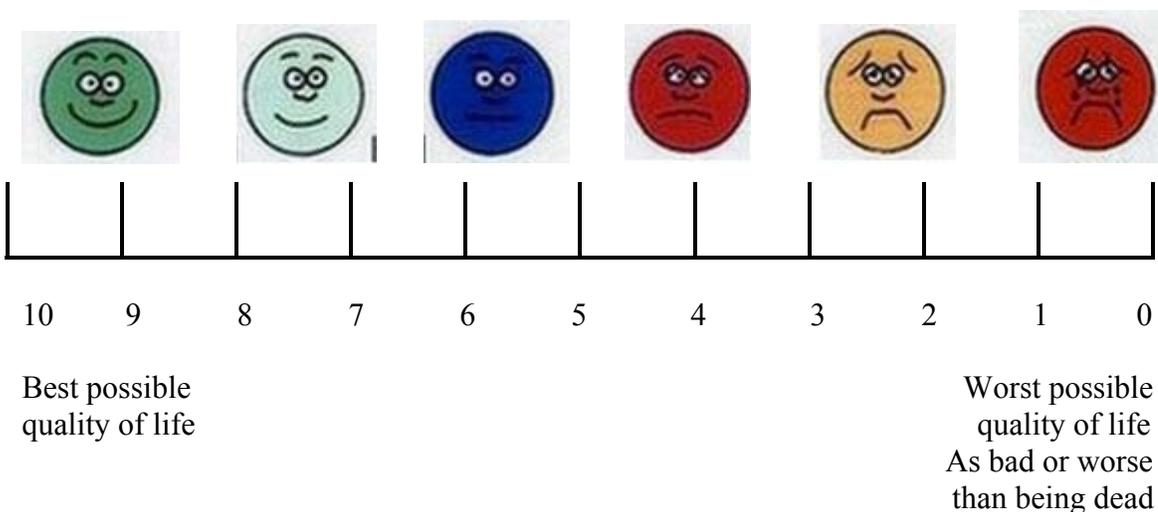
	<b>WOMEN</b>	Not a problem	A little of a problem	Somewhat of a problem	Very much a problem
<b>46.</b>	Lack of sexual interest.	1	2	3	4
<b>47.</b>	Inadequate lubrication.	1	2	3	4
<b>48.</b>	Difficulty having orgasm.	1	2	3	4
<b>49.</b>	Ability to satisfy sexual partner.	1	2	3	4

		Very satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Somewhat dissatisfied	Very dissatisfied
<b>50.</b>	Overall, how satisfied were you with your sexual function <b>during the past 4 weeks?</b>	1	2	3	4	5

		Not at all	Slightly	Moderately	Quite a bit	Extremely
<b>51.</b>	During the <b>past 4 weeks</b> , to what extent have problems with your bowel or bladder function interfered with your normal social activities with family, friends, neighbors or groups?	1	2	3	4	5
<b>52.</b>	During the <b>past 4 weeks</b> , how much did <b>pain</b> interfere with your enjoyment of life?	1	2	3	4	5

**Quality of Life**

53. Overall, how would you rate your own quality of life?



		Terrible	Unhappy	Mostly dissatisfied	Mixed – about equally satisfied and dissatisfied	Mostly satisfied	Pleased	Delighted
<b>54.</b>	Which best describes how you feel about your life as a whole?	1	2	3	4	5	6	7

## Curriculum Vitae

Candidate's full name: Yvonne Marie Barrett

Universities attended: University of New Brunswick, 2005 – 2006  
Honours, Psychology  
University of New Brunswick, 1999 – 2003  
Bachelor of Arts, Psychology

### Publications:

Robinson, B.A., DiTommaso, E., Barrett, Y., & Hajizadeh, E. (2013). The Relation of Parental Caregiving and Attachment to Well-Being and Loneliness in Emerging Adults. *Psychology and Education: An Interdisciplinary Journal*, 50(3/4), 19-31.

### Conference Presentations:

Barrett, Y., DiTommaso, E., Cook, P., & MacLean, G. (2012, June). *A Longitudinal Study Predicting Quality of Life in MS Patients: The Role of Psychological Determinants. Time 1 and Time 2*. Poster presentation given at Canadian Psychological Association (CPA) in Halifax, NS.

Barrett, Y., DiTommaso, E., Cook, P., & MacLean, G. (2012, March). *A Longitudinal Study Predicting Quality of Life in MS Patients: The Role of Psychological Determinants. Some Initial Findings*. Poster presentation given at iHR Day (Interprofessional Health Research Day) in Saint John, NB.

Barrett, Y. & DiTommaso, E. (2011, June). *Attachment and Problematic Eating Behaviours: The Mediation Role of Coping. Study 1 and Study 2*. Poster presentation given at Canadian Psychological Association (CPA) in Toronto, ON.

DiTommaso, E., Barrett, Y., Cook, P., & MacLean, G. (2011, March). *A Longitudinal Study Predicting Quality of Life in MS Patients: The Role of Psychological Determinants*. Poster presentation given at iHR Day (Interprofessional Health Research Day) in Saint John, NB.

DiTommaso, E., Barrett, Y., Cook, P., & MacLean, G. (2010, November). *A Longitudinal Study Predicting Quality of Life in MS Patients: The Role of Psychological Determinants*. Poster presentation given at New Brunswick Health Research Foundation (NBHRF) in Saint John, NB.

Barrett, Y. & DiTommaso, E. (2010, March). *Attachment and Problematic Eating Behaviours: The Mediation Role of Coping*. Poster presentation given at iHR Day (Interprofessional Health Research Day) in Saint John, NB