DEPRESSION, FATIGUE, DECLINES IN COGNITIVE FUNCTION AND UNCERTAINTY IN WOMEN WITH MULTIPLE SCLEROSIS

by

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This has been a long journey and I am better for having walked it. Thank you all!

DEDICATION

M.S. by Rose Robinson

Strong but then weak
Happy but then sad
Sometimes feeling hopeful
Always dreading the bad

Scared and uncertain,
Where will it end?
Way too frightened
To peer past the bend

Why has life dealt me
This terrible blow?
I used to feel great
But now I feel low

I feel so frustrated
And angry, unsure
Will I ever experience
Life 'as before'?

I know I am loved
And people, they care
So why do I feel lonely
And no-one is there?

This illness is evil
Seeps right through my soul
I want to feel warmth
But it leaves me so cold

I have to believe
That my strength will endure
I will deal with this illness
Though I know there's no cure

I know I can't beat it
But I know I can cope
I don't want your sympathy
I just want some hope

So I'll smile and I'll laugh
And make sure I survive
I'm ME – a good person
And I'm very much alive

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ABSTRACT

The purpose of this study was to describe the relationships among common signs/symptoms (depression, fatigue, declines in cognitive function) in women with multiple sclerosis (MS) using a modified version of Braden's Self Help Theoretical Model and evaluate whether depression, fatigue, declines in cognitive function and uncertainty, enabling skills (self-control in this study) and self-management (coping in this study) influence quality of life outcomes in women with MS. MS is one of the most common causes of disability among young adults and is the most prevalent neurological disease among young and middle-aged adults in certain parts of the world. Although research had previously been undertaken with regards to the common symptoms of MS, uncertainty, enabling skills, self-management and quality of life, there had been no studies undertaken that involved all of them. This descriptive study was the first to explore relationships among common symptoms of MS, uncertainty, enabling skills, self-management and quality of life in an MS population using Braden's Learned Response Chronic Illness Self Help Model. A cross-sectional descriptive study was conducted with 106 participants. Measurement tools utilized in the study included: 1) Demographic and Illness Characteristics, 2) The Modified Fatigue Impact Scale, 3) Perceived Deficits Questionnaire, 4) Patient Health Questionnaire-9, 5) Mishel's Uncertainty in Illness Scale- Adult, 6) Rosenbaum's Self-Control Scale- Modified, 7) COPE Inventory-Brief, and 8) SF-36 Health Status Questionnaire. Data analysis involved descriptive statistics, correlations and linear regression to answer the specific aims. The study findings indicate that relationships exist among depression, fatigue, declines in cognitive function, uncertainty, enabling skills and self-management in women with MS. The study findings also indicate that depression, fatigue, declines in cognitive

function, uncertainty, enabling skills and self-management influence quality of life outcomes in women with MS. Finally, while only a first study, the research findings indicate using a modified version of Braden's Learned Response Chronic Illness Self Help Model (LRCISHM) is appropriate in a population of women with MS.

Future research involving women with MS who meet the inclusion criteria across the contiguous United States as well as male military veterans with MS is recommended. Research involving this modified version of Braden's LRCISHM as well as research incorporating disability levels is recommended. Research to develop interventions to improve quality of life outcomes and minimize distress is also recommended.

CHAPTER I: INTRODUCTION

Multiple Sclerosis (MS) is the most prevalent neurological disease among young and middle-aged adults in the United States, Europe and Australia. According to the Institute of Medicine (2001), approximately 1 in 1,000 people develop MS, typically in their late twenties, and about two-thirds of them are women. It is also one of the most common causes of neurological disability in young adults (National Institute of Neurological Disorders and Stroke [NINDS], 2008; National Institute of Health [NIH], 2013). A chronic and often debilitating disease of the central nervous system, MS presents itself in a variety of physical, cognitive and psychological symptoms. Common symptoms of MS may include impaired working memory and a diminished alert state, spasticity, double vision, weakness, bladder incontinence, depression and fatigue (National Multiple Sclerosis Society [NMSS], 2013). Among the most prevalent symptoms are depression and fatigue. Symptoms of MS vary from person to person, as does symptom onset, exacerbation duration, residual deficit and time between relapse; all of which impact symptom management and disease uncertainty. This, combined with the unpredictable episodes of neurological deficit endured by those with MS, has been associated with feelings of anxiety, uncertainty and poorer quality of life (McReynolds, Koch & Rumrill, 1999).

While the etiology of MS as well as signs, symptoms and treatment modalities is frequently a subject for discussion and research, there remains no cure. With over 2.5 million worldwide suffering from MS and an estimated 200 new cases each week (NMSS, 2008; NINDS, 2008b), symptom management and identifying ways to improve quality of life for this population are essential. The long term goal of this research is to develop interventions to

improve quality of life outcomes in those with MS and potentially minimize the psychological distress associated with the uncertainty of MS.

Purpose of the Study

The purpose of this study is to: 1) describe the relationships among common signs/symptoms (depression, fatigue, declines in cognitive function) in women with MS using a modified version of Braden's Self Help Theoretical Model, and 2) evaluate whether depression, fatigue, declines in cognitive function and uncertainty, enabling skills (self-control in this study) and self-management (coping in this study) influence quality of life outcomes in women with MS. Quality of life is defined in this study as overall enjoyment of life, one's sense of well-being and how the ability to perform various daily activities.

Background and Significance

MS is a chronic disease of the central nervous system (CNS). It was first discovered in the 19th century when physicians, examining the brains and spinal cords of patients who had died with this illness, discovered similar areas of nervous tissue that appeared scarred on visual examination and hard on palpation (Harling et al., 2005).

Historically, diagnosing MS was difficult, often inconclusive and required years of clinical evaluation with supporting documentation of signs and symptoms of the disease. Diagnostic criteria updates in 2001 specified use of magnetic resonance imaging (MRI), visual evoked potentials (VEP), and cerebrospinal fluid (CSF) analysis prior to making a diagnosis. These criteria, now referred to as the McDonald Criteria are believed to make the diagnosis process easier and more efficient. In addition to the MRI, VEP and CSF analysis, a neurological exam is performed and a thorough medical history is obtained prior to diagnosis. To be given a

diagnosis of MS, there must be evidence of two distinct episodes of symptoms occurring at least two months apart. Each episode must have lasted at least 24 hours and include two or more signs of evidence (damage) upon examination involving at least two parts of the brain and spinal cord.

Most people are diagnosed with MS between the ages of 20 and 40 but the severity of the disease is not age dependent and the lifetime expectancy remains normal. Studies undertaken to examine the history of MS suggest that while there are different patterns of disease activity, only 20% experience a benign form of the disease (DiBernardo, 2002). MS is one of the most common causes of non-traumatic disability among young and middle-aged people in the United States. Healthcare costs associated with MS are estimated at over $10 billion annually (Cleveland Clinic, 2011). Studies show that irreversible disability in terms of walking occurs at a median age of 44. The average patient utilizes a cane within 15 years of disease onset and is wheelchair bound within 30 years (Confavreux & Vukusic, 2006; Cleveland Clinic, 2011). In patients with mobility impairment and decreased quality of life, the indirect costs of MS are estimated at $30,000 per year per individual (Coleman, Sidovar, Roberts & Kohn, 2013). According to Cooper, Law and Sarnoff (2003), there are approximately 400,000 individuals in the United States suffering from MS and over two million people world-wide. However, with roughly two hundred new cases presented monthly, these figures from a decade ago may under-estimate disease prevalence.

MS is seen primarily in Caucasians, and women are more likely to be diagnosed when compared to men (NMSS, 2013). The American Academy of Neurology (2007) reported that in 1940, the ratio of women to men with MS in the United States was two to one. By 2000, that ratio had increased to approximately four to one. Due to the high prevalence of MS in women,

the focus of this study was on women. Kantarci and colleagues (2006) found that while the prevalence may be higher in women, the Carter effect, defined as whom within the parental dyad transmits the disease, and is demonstrated in the transmission of MS. The Carter effect indicates that affected fathers are 2.2 times more likely to transmit to their offspring than affected mothers. However, Ebers, Herrera and colleagues (2007) found that mothers and fathers transmit the disease at the same rate, with projections of 9.76% and 9.41% respectively. In the general population, the risk of developing MS is 0.15%. The risk for individuals with a first degree relative is between 1.0% and 4.0%. The risk for unaffected twins to develop MS is 2.0% for fraternal twins and 25% for identical twins (DiBernardo, 2002).

As yet, there is no cure for MS. A normal lifetime expectancy awaits individuals with MS and disease severity is independent of age, increasing the unpredictability facing this population. Thus, the focus of nursing and healthcare must be on strategies to facilitate maximum health and quality of life.

Theoretical Framework

This descriptive study will be the first to explore the relationships between depression, fatigue and declines in cognitive function in an MS population using Braden's Learned Response Chronic Illness Self Help Model (LRCISHM). While Braden's framework (Braden & Mishel, 2000) has been used in nursing research for over twenty years, the relationships among the variables in the model have not been explored with those with MS. Previous studies have focused on other chronic illnesses including systemic lupus erythematosus, cancer, rheumatoid arthritis, and persons with other disabilities (LeFort, 2000; Owens, 2007; Chuang, Lin & Gau, 2010; Braden, 1993). Unlike individuals with other chronic illnesses that do not have cognitive

decline as a major consequence, a majority of those with MS begin to experience cognitive decline within five years of disease onset. Cognitive decline in turn will affect working memory, sustaining attention, and performing tasks that involve reasoning, problem solving and planning (Compston, 2006; Koopman, 2006; NMSS, 2008a; Wilken, Sullivan & Rogers et al., 2008).

The LRCISHM is a middle range theory that emphasizes the dynamics of learned response and self-management, especially in chronic illness populations (Braden, 1990a). Based on her work with Mishel (1988; 2000) and her analysis of Seligman's Learned Helplessness Theory, Baltes' Instrumental Passivity Theory and Rosenbaum's Learned Resourcefulness Theory, Braden (1990a) developed her model as a means to describe the dynamics of learned response (learned self-management) to chronic illness (Braden, 1990). According to Braden (2001), a range of behavioral outcomes observed in persons diagnosed with chronic illness, behaviors that may or may not be congruent with the severity of illness and debility, along with a need to better understand the phenomenon, sparked her research. Recognizing the impact chronic illness had on our society, Braden (1993b) highlighted the complications that can result from chronic illness characterized by periods of remission and exacerbation in the illness course.

Consistent with Rosenbaum's hypothesis that the use of enabling skills in self-management can minimize the negative effects of exposure to disruptive forces, Braden's (1993b) model is based on the assumption that adjustment is a learned trait rather than inherited. The purpose behind this approach to chronic illness experience derives from the belief that were there only negative aspects involved, individuals would not be capable of exhibiting self-management.

The central concepts of Braden's model include illness severity, uncertainty, enabling skills, self-help, and quality of life. The concepts of enabling skills and self-help are a concern for use in an MS population where cognitive impairment has been shown to impact one's ability to self-monitor and be aware of self-behaviors; however, it merits exploration. The primary assumption of Braden's theory is that adjustment is a learned trait and not an inherited one (see Figure 1).

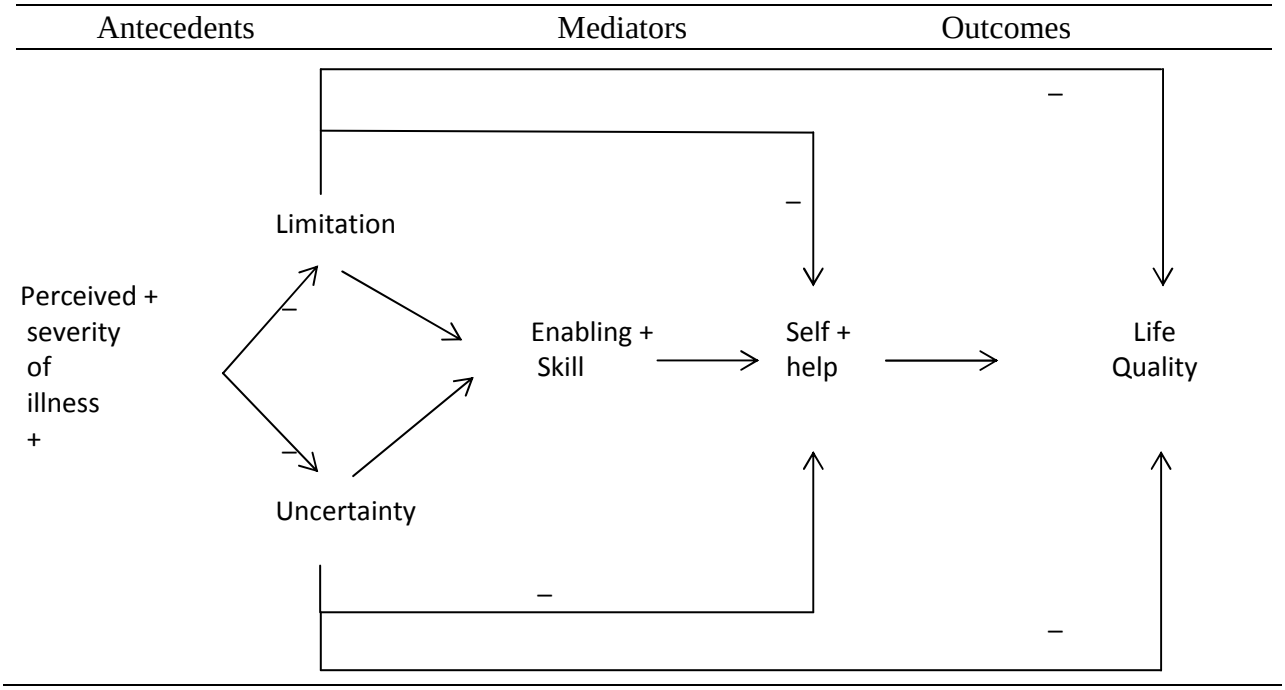

FIGURE 1. Hypothesized Relationship of Constructs in the Self-Help Model (from LeFort, 2000).

The major concepts initially defined by Braden (1990b; 1993b) are still identified as central variables within the five stages (as cited by Owens, 2007; LeFort, 2000):

1) Severity of illness (level of infliction, related to *disease characteristics* and *background characteristics*);

2) Uncertainty [defined by Mishel (1988) as the inability to determine meaning in illness events];

3) Enabling Skill [central mediator to Braden's model that involves problem solving, cognitive reframing resources and belief in self (Owens, 2007; Braden, 1990b, 1993b)];

4) Self Help [one's perceived ability to maintain adult role performance (LeFort, 2000; Braden, 1993b)];

5) Life Quality [subjective phenomena from multiple domains that interact in a feedback process with earlier stages affecting quality of life outcomes (Owens, 2007; LeFort, 2000; Braden, 1993b).

Braden (1990b; 1993b) detailed five stages in her theory. Stage I includes stressors or stimulators to learning such as *background characteristics*, *disease characteristics* and *illness severity.* Stage II involves averse aspects including *uncertainty* and dependency. Stage III includes mediators, or *enabling skills*, such as cognitive reframing used to counter adversities in order to reach desired outcomes. Stage IV involves *Self-help* activities such as activities an individual values in his/her life and Stage V involves *Life Quality.*

Minor adaptations in the definitions used to identify Braden's stages have developed over the years. For example, while Braden made reference to the enabling skills of Stage III as potential mediators of negative factors in chronic illness experience (a reference supported by LeFort), Owens (2007) referenced Stage III in her work as 'Coping repertoire.' Braden's reference to the major aversive aspects of Stage II is mirrored by Owens' (2007) use of 'Averse experience' which differs in wording from LeFort's (2000) conceptual linkage as 'Antecedents'.

Perhaps the largest difference seen is how Owens (2007) altered Stage IV to ‘Adaptation activities’ and included not only previously utilized variables *Self-help* and *Self-care* but specified *Psychological Adjustment* and introduced a variable specific to her research-*Complementary and Alternative Medicine.* These successful adaptations to Braden’s model offer additional support for its use as a framework to guide nursing education and interventions for care in chronic illness populations such as Multiple Sclerosis.

For my study, I have modified Braden’s model as illustrated in Figure 2 to create a more parsimonious model that includes the concepts that have the most empirical support in MS. In Stage I, I operationalize *background characteristics, disease characteristics* and *illness severity* as follows: First, I will specifically measure demographic or background characteristics (e.g., age, date of diagnosis, age at diagnosis, age at symptom onset if known and employment status). Second, I will measure disease characteristics (e.g., form of disease at diagnosis if known, current form of disease if known) along with *illness severity* as *depression, fatigue and cognitive functioning.* In Stage II, the *adverse aspects* I will measure are *uncertainty.* In Stage III, *self-control* will be utilized for *enabling skills.* In Stage IV, I *Self-Help* will be conceptualized as *Self-Management* (coping skills in this study) and Stage V is *Life Quality* conceptualized as *QOL: Physical Health* (*Quality of Life [QOL]*) and *QOL: Mental Health*.

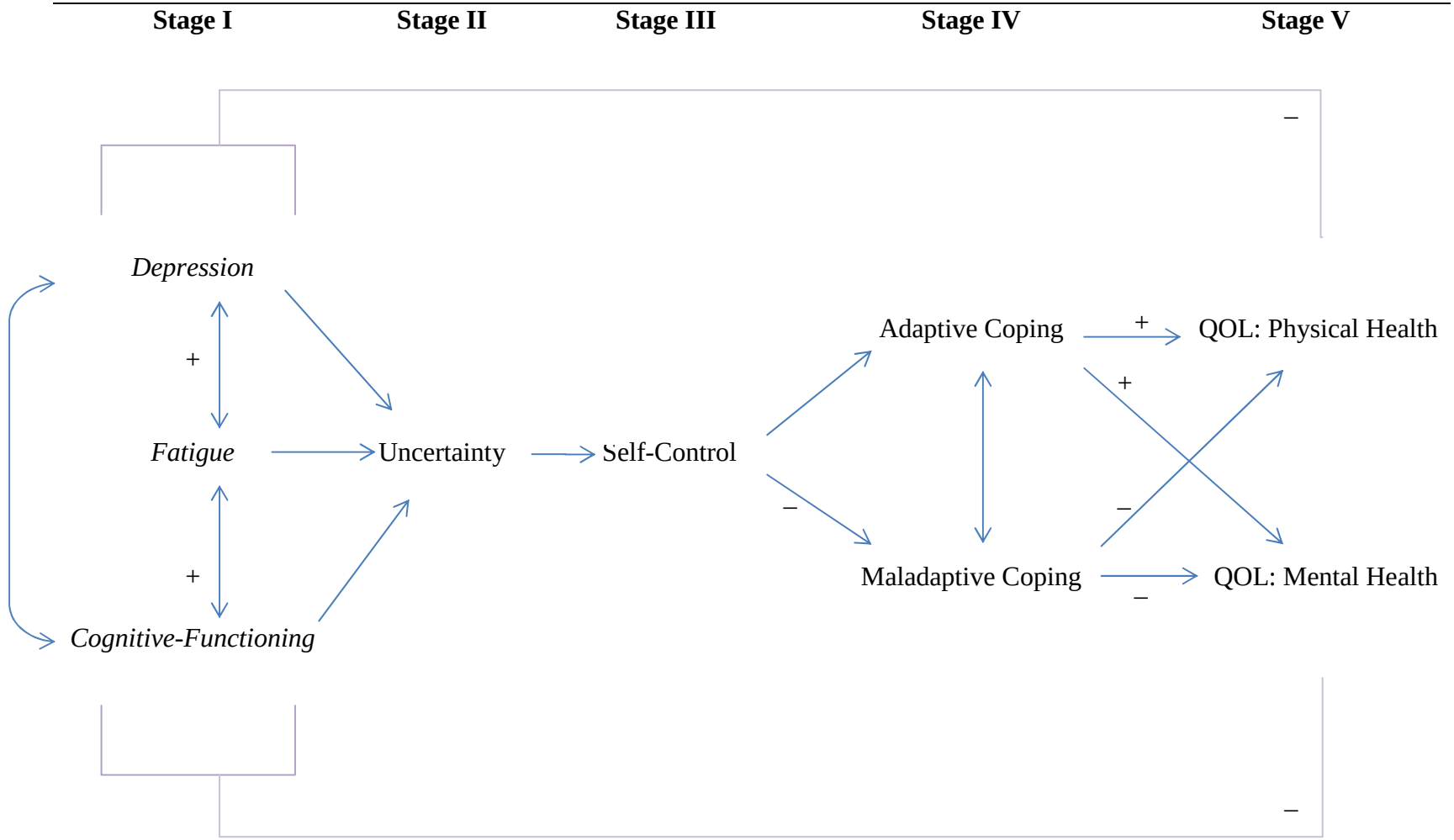

FIGURE 2. Hypothesized Relationships of Constructs in Modified Self-Help Model: An MS Population

In this adaptation of Braden's model, regression analysis will be used to describe the relationships among the variables within Stage I as well as the central concepts throughout the model. This research seeks to explore the following questions: 1) What are the relationships between depression, fatigue and declines in cognitive function? 2) Are there any relationships between these variables and uncertainty? 3) Does uncertainty affect enabling skills (self-control in this study) and self-management (coping skills in this study)? 4) Do declines in cognitive functioning have an effect on enabling skills (self-control in this study) and self-management (coping skills in this study)? 5) Is there a relationship between enabling skills and self-management? 6) What influence do uncertainty, enabling skills (self-control) and self-management (coping skills) have on quality of life? 7) How do these variables (depression, fatigue and declines in cognitive function) influence quality of life?

Summary

Multiple Sclerosis is a complex disease process. The signs and symptoms vary between patients and the disease develops and manifests differently in each person. Throughout the disease process some consistencies exist; at some point most will suffer from depression, fatigue and declines in cognitive functioning. The literature indicates that a relationship exists between these common symptoms and Braden's model has been used to show them in other chronic illness populations. However, research has not explored these relationships using Braden's model nor has Braden's model been used in an MS population. In the next chapter, the literature will be reviewed.

CHAPTER II: REVIEW OF THE LITERATURE

Multiple sclerosis (MS) is a chronic and often debilitating disease of the central nervous system. The complexity that surrounds MS in terms of disease development and progression, pathophysiology and disease course can be very daunting. To facilitate reader understanding, this chapter has been broken into four distinct sections. In the first section, four factors that may trigger MS are discussed. In the second section, the pathophysiology of MS is introduced including discussion of how the pathophysiological hallmarks of MS begin to exist independently of each other. The third section outlines the different disease courses of MS. In the last section, literature regarding MS and quality of life is presented for the reader.

Potential Triggers of Multiple Sclerosis (MS)

Multiple sclerosis may not be caused by a single gene, virus, deficiency or trauma (NIH, 2013; Sherwood, 2006). On the contrary, a varied combination of genetic traits, environmental influences, exposures to viruses and/or toxins, as well as nutrition deficiencies, are believed to trigger MS (Figure 3). Furthermore, researchers are uncertain if this inflammatory disease is initiated by the immune system or by a primary event that has impacted the neural cells (Prat & Antel, 2005). In this section, several different factors that may trigger MS are discussed including genetics, environmental, pathogens and toxins, and nutrition.

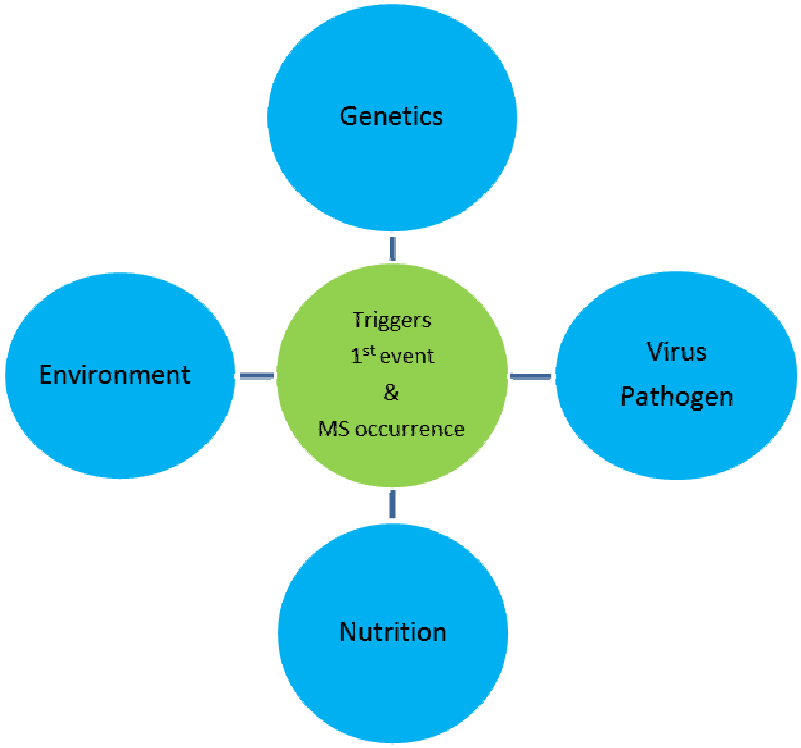

FIGURE 3. Possible Triggers of Multiple Sclerosis.

Genetics

Research has shown that there are several genes which make an individual susceptible to developing the disease (Reich et al., 2005; Sawcer et al., 2005). Genes associated with the Major Histocompatibility Complex (MHC), which help determine immune response, have shown definite links to MS (Figure 3). Various genetic mapping studies undertaken since the 1990s have linked chromosomes 1, 3, 5, 6, 19 and 17q11 to MS (Reich et al., 2005; Sawcer et al., 2005). The GAMES Collaborative Group (2006) found seventeen microsatellite markers identified as candidate genes for developing MS in individuals of European descent. Five of the markers mapped within the MHC and three more were linked to chromosomes 20p12.2 and 11q23.1. Researchers continue to study the human genome, mapping genetic activity to MS, in

hopes of one day determining all the chromosomes associated with the disease. Yet, even then, researchers recognize that they will still be far from determining how the markers interface. Perhaps that is why genome researchers at the University of California at San Francisco have begun to accumulate newly identified genomic regions to investigate how the accumulation of common genetic variants in single individuals shapes the variability of MS outcomes (Gourraud, 2011).

Environment

The National Multiple Sclerosis Society (2013) found that symptoms of MS may be triggered by an environmental factor, a proposal known as the environmental theory, which suggests variations in geography, demographics, and migration patterns may impact risk. The prevalence of MS in more northern latitudes around the globe supports that environmental agents may trigger the disease (Figure 3). For example, northern states such as Vermont and Washington have more than 200 cases per 100,000 people while southern states like Alabama and Florida have fewer than 50 cases per 100,000 people (DiBernardo, 2002). However, should high levels of vitamin D exposure be linked with improved immune function as posited by Schwarz and Leweling (2005), its higher prevalence in those living closer to the equator may provide a different view of the environmental factor. While evidence supports the hypothesis that there are a greater number of cases of MS in temperate climates than subtropical climates, the environmental factor that triggers MS remains unknown.

Pathogens and Toxins

Researchers historically believed that certain viruses may cause demyelination in the CNS of humans and animals (DiBernardo, 2002). While there is also an increased incidence of

MS exacerbations exhibited in individuals complaining of non-specific viral syndromes, the clinical pattern and disease progression does not mirror MS attacks (DiBernardo, 2002). Sherwood (2006) reported 70% of MS patients in one study showed evidence of an active form of the herpes virus, HHV-6. However, in recent years Ludwin (2006) has questioned the probability that exposure to a toxic agent or infectious process triggered this inflammatory disease. To date, researchers remain uncertain as to whether or not the etiology of the axonal damage and inflammation makes the individual more susceptible to pathogens or if exposure to pathogens or toxins leads to inflammation and axonal damage.

Nutrition

Research involving nutrition and MS has not yielded many answers. Alter and colleagues (1974) were among the first to look at nutrition and MS prevalence by evaluating daily caloric, fat and protein consumption. In the years since, research involving nutrition and MS has not definitively proven that any particular diet benefits or exacerbates symptoms of those with MS (Schwarz & Leweling, 2005). The National Multiple Sclerosis Society (2006) reports no definitive link between diet, dietary deficiencies and developing MS or experiencing MS attacks. There are no significant studies supporting improvements in MS with use of a special diet, vitamin intake or high dose minerals; however, Schwarz and Leweling (2005) suggest vitamin D is associated with a lower incidence of MS. In general, patients with MS are recommended to maintain a diet high in fiber and carbohydrates, such as fruits and vegetables, which also contain phytochemicals, and which may help with symptoms associated with MS such as fatigue (Bailey, 2006).

In this section, the epidemiology of MS was discussed. Research to date reveals that MS can be found on several genetic markers, indicating it may not be caused by a single gene. The multiple factors that may trigger MS, including genetics, pathogens and toxins, nutrition and the environment were expanded upon.

Pathophysiology of Multiple Sclerosis

In this section the pathophysiology of MS will be discussed under four distinct sections. The sections are Myelin, Immune System, Lesions, and Major Histocompatability Complex.

Myelin

MS is considered a demyelinating disease due to its effect on the fatty substance called myelin (Sherwood, 2006). Myelin is made up of two different types of cells that wrap around the axon. The cells in the central nervous system (CNS) are oligodendrocytes while the cells in the peripheral nervous system (PNS) are Schwann cells. Oligodendrocytes form myelin in the CNS, the lipid composition due to the lipid bilayer containing the plasma membrane. Schwann cells supply the myelin sheath for the PNS, containing a similar lipid and protein composition to the oligodendrocytes of the CNS, yet they differ in appearance. Schwann cells, unlike oligodendrocytes, function as individual cells that wrap around the nerve fiber in a jelly-roll fashion (Sherwood, 2006). Another difference is the major protein contained in Schwann cells is myelin protein zero (MPZ), a transmembrane protein that assists in compacting lipid bilayers of myelin (Anthony, Frosch & Girolami, 2005). Finally, it is the Schwann cell's ability to guide the regeneration of peripheral axons in peripheral nerves that distinguishes it from the oligodendrocytes. Unlike the oligodendrocytes, which contain proteins that inhibit axonal

growth, the Schwann cells form a regeneration tube that guides the regenerating nerve fiber to its destination (Sherwood, 2006).

Myelin is the insulating sheath housed in the CNS and PNS, surrounding the nerves in the brain and the spinal cord (Accelerated Cure Project for Multiple Sclerosis [ACPMS], 2006). The role of myelin is to provide insulation for the nerves thus enabling impulse conduction between the brain, spinal cord and PNS. Myelinated fibers utilize less energy and conduct impulses roughly fifty times faster than unmyelinated fibers, making them essential in signal transmission (Sherwood, 2006). In patients with MS, the myelin has been destroyed in various areas, leaving damaged scar tissue called sclerosis in its wake and often damaging the nerve fiber directly. Initially, the body is able to repair myelin damage through a process known as remyelination whereby the oligodendrocyte progenitor cells can remyelinate the axons. Over time, the process fails when irreversible tissue injury exceeds threshold and the nervous system cannot compensate (Fox, Lisak & Conner, 2009). The destruction and resultant damage disrupt impulse conduction between the CNS and PNS, making it difficult and sometimes impossible for nerve signals to reach their destinations (ACPMS, 2006). The loss or damage of nerve fibers is the major cause of permanent disability in patients with MS (Foote & Blakemore, 2005).

Immune System

MS is often characterized as an autoimmune disease, which means that the body's own defense mechanisms attack themselves (Fox, Lisak & Conner, 2009). In this case, the defense systems act specifically on the myelin within the CNS which, as previously mentioned, insulates the nerves of the brain and the spinal cord. Demyelination and inflammation are the first pathological features of MS (Rose, 2013). As a result, or maybe in conjunction with the myelin

destruction, the nerve fibers suffer degeneration that can impair movement, coordination, sensation, and thinking (NIH, 2013). This inappropriately directed cellular immune response, detailed further below, results in lesions that are dispersed across the white matter of the brain (ACPMS, 2006).

Lesions

The CNS can be divided into two forms of matter: grey and white. Grey matter is made up of neurons while white matter is comprised of the axons that are encased in the myelin sheath formed by oligodendrocytes (DiBernardo, 2002). MS is sometimes referred to as a white matter disease because the lesions (used here interchangeably with the word plaque) tend to form only on the white matter. Lesions are the second pathologic feature of MS and are formed as a direct result of an inappropriately directed cellular immune response (Boss, 2002; Anthony, Frosch & Girolami, 2005). Three different types of neocortical lesions suspected of impacting cortical function have been identified through magnetic resonance imaging and are described as leukocortical (type I), intracortical (type II), and subpial (type III) (Wegner et al., 2006).

Microscopically, the plaques are made up of inflammatory cells, astroglial cells, edema and destroyed myelin fragments. The plaques vary in size and can be found throughout the white matter with extensions into the grey matter sometimes visible with diagnostic imaging (Anthony, Frosch & Girolami, 2005). The inflammatory cells are dominated by macrophages and T lymphocytes, but some antibody producing plasma B cells are also present. The role of the macrophages within the plaques is uncertain; researchers have not yet determined if they are damaging the myelin or clearing away previously destroyed myelin (DiBernardo, 2002). It is the appearance of chronic inflammatory cells within and around these lesions that brought

researchers to study the underlying immune mechanisms in myelin destruction (Boss, 2002).

Major Histocompatibility Complex

The Major Histocompatibility Complex (MHC) is essentially a group of genes whose roles include directing the synthesis of MHC molecules. Antigens in the bloodstream are eaten by macrophages which digest the antigen into smaller particles called peptides (ACPMS, 2006). The TH1 subset of white blood cells capable of recognizing and activating the MHC-peptide complex express their own cellular functions, secreting proteases and endothelial cells to the CNS. A similar process occurring in the CNS with the glial cell is what researchers suspect may cause the auto-immune response in patients with MS. Specifically, researchers believe the glial cell contains a break-down of myelin, which is in turn recognized as a viral peptide by the TH1 cell (ACPMS, 2006). In a case of what researchers refer to as 'mistaken identity', the TH1 cell proliferates, producing cytokines that promote inflammation like interleukin-1 and -2, interferon-gamma, and tumor necrosis factor-alpha. Normally, there is a balance between TH1 cell proliferation and proliferation by another set of T-cells called TH2 cells, whose cytokines regulate those of TH1. A suspected imbalance occurs in patients with MS, resulting in further demyelination (ACPMS, 2006).

Together these pathophysiological changes cause an inappropriate immune response, inflammation, and neuronal cell damage. With the inappropriate immune response, we see T cells in the brain, the secretion of cytokines and macrophages which destroy myelin, and eventually cellular imbalance and proliferation that result in demyelination. The inflammation damages the myelin sheath and results in damage to the axons directly and while the exact cause remains unclear, an autoimmune response against CNS antigens is suspected (Sadovnick, 2006).

When irreversible tissue injury exceeds the threshold and the nervous system cannot compensate, the disease becomes a degenerative process and deterioration is independent of inflammation and immune response. At this point, remyelination is no longer possible (Fox, Lisak & Conner, 2009). Figure 4 is a visual representation of these pathophysiological responses that can be both cause and effect to one another but ultimately can also act independent of one another.

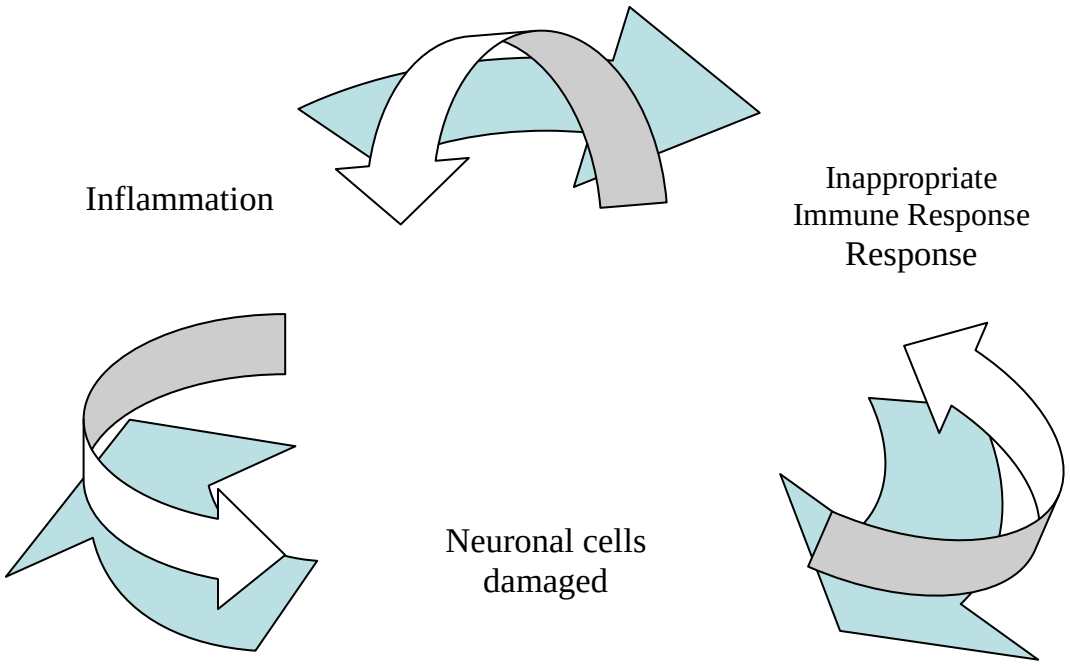

FIGURE 4. Pathophysiological Responses Seen After Multiple Sclerosis Onset

Disease Course

MS falls under four disease courses which may be mild to severe and those with MS may move from one course to another more progressive form of the disease throughout their lifetime. In this study, participants with all four courses of MS were recruited.

Relapsing-Remitting MS

Initially diagnosed in 85% of those with MS, is characterized by clearly defined attacks (called relapses or exacerbations) involving worsening neurological function followed by partial or complete recovery periods (called remissions) exhibiting zero disease progression.

Primary-Progressive MS

Seen in approximately 10% of those with MS, is characterized by slowly worsening neurologic function absent of distinct relapses and remissions. Disease progression may vary over time and temporary minor improvements may be seen.

Secondary-Progressive MS

Is characterized by a steady worsening of the disease process with or without relapses, remissions and plateaus. This disease course is seen in those who first had Relapsing-Remitting MS (RRMS). Historically developed within ten years of RRMS diagnosis, medications aimed at modifying MS progression may delay this transition, but long term data is not yet available.

Progressive-Relapsing MS

A rare disease course seen in approximately 5% of those with MS is characterized by clear attacks of worsening neurologic function from onset and may or may not involve minimal recovery and progresses without remission (NMSS, 2013).

Multiple Sclerosis and Quality of Life

MS is a complex disease that manifests itself differently in each person for a variety of reasons including severity, type, and pathophysiological changes in the central nervous system. However, some aspects of the disease are seen in a majority of the MS population. This study focuses on the following concepts affecting quality of life in MS: depression, fatigue, declines in

cognitive function, uncertainty, self-control and coping. These concepts were illustrated in Figure 2.

Depression and Quality of Life

Depression is the most common psychological problem associated with MS. Affecting over 50% of the MS population, the odds of an individual with MS suffering from depressive symptoms are 2.3 times greater than the general population (Koopman, 2006; Mohr & Cox, 2001; Kerns, 2000; Chalk, 2007; Kroencke, Denney & Lynch, 2001; Lynch, Kroencke & Denney, 2001; Patten, Beck, Williams, Barbui & Metz, 2003; Thornton et al., 2006). In a cross-sectional study, White and colleagues (2008) found depression was the most significant predictor of health distress in people with MS. The DSM-5 (2013) characterizes depression as the presence of at least five of the following symptoms lasting for at least two weeks: sad mood, difficulty sleeping, self-blame and feelings of guilt, poor self-image, change in appetite, loss of pleasure or interest in activities, altered concentration and suicidal thinking.

While the prevalence of depression in MS may not be related to gender or age, it may be related to disease form (Montel & Bungener, 2007). Patients with the relapsing-remitting and secondary-progressive forms of MS had a higher incidence of major depressive disorder (10 and 12%, respectively) than those with primary-progressive MS (7%) (Montel & Bungener). Clinically significant depression has been associated with higher levels of disability, anxiety and distress (Chalk, 2007; Janssens et al., 2006; Lynch et al., 2001) as well as a rise in primary care visits (Williams et al., 2005). Depression has been negatively associated with self-efficacy (Thornton et al., 2006; Trojan et al., 2007; Lester, Stepleman & Hughes, 2007). Furthermore, numerous studies found that depression is negatively associated with quality of life for this

population (Chalk, 2007; Janssens et al., 2006; Montel & Bungener, 2007; Phillips & Stuifbergen, 2006; White et al., 2008; Williams et al., 2005).

Fatigue

The NMSS (2013) reports fatigue is one of the most commonly reported symptoms in MS, more prevalent than depression, affecting at least 75% of the population. In MS, fatigue is characterized as falling into one of two categories: primary fatigue (PF) and non-primary fatigue (NPF). PF can be directly attributed to the pathophysiological changes within the central nervous system brought on by the disease process while NPF is associated with a) symptoms of MS (e.g., depression), b) acute situations (e.g., infection), or c) other factors such as chronic pain, self-efficacy and uncertainty (Forwell, Brunham, Tremlett, Morrison & Oger, 2008; Trojan et al., 2007; Penner et al., 2007). Treatment and management of fatigue in those with MS is complicated by its subjective nature, its diagnosis by exclusionary measures, and its various origins.

A subjective experience, fatigue is sometimes referred to as the invisible symptom because it is not always apparent to anyone other than the individual experiencing it. The National MS Society (2013) indicates fatigue in MS can come on suddenly, may be present in the morning even after a restful sleep, typically worsens as the day progresses, is generally more severe than fatigue experienced by those without MS, and is more likely to interfere with activities of daily living. Physical fatigue levels in those with MS may not be congruent with physical activity; minimal exertion may leave a patient feeling overwhelmingly tired and weak (Multiple Sclerosis Society, 2011). Mental fatigue can have wide spread effects; patients report

difficulty concentrating, completing tasks, coordinating activities and having family members confuse their fatigue for depression (United Kingdom MS Society, 2013).

Previous studies have identified a relationship between depression and fatigue. Higher depression scores have been positively associated with higher fatigue scores (Trojan et al., 2007; Van der Werf et al., 2003; Penner et al., 2007; Williams et al., 2005). Penner and colleagues (2007) found physical impairment and physical fatigue were positively correlated when controlling for depression. Additionally, high mental fatigue scores were associated with higher depression scores. Fatigue has been associated with higher incidences of depression, stress, poor sleep quality, and low self-efficacy in other studies (Penner et al., 2007; Trojan et al., 2007; Van der Werf, Evers, Jongen, & Bleijenberg, 2003).

Uncertainty

Mishel (1988) defines uncertainty as 1) the inability to determine meaning in illness-related events and 2) a cognitive state that occurs when insufficient cues exist to enable individuals to accurately predict outcomes or structure events. Uncertainty has emerged as an important variable in coping strategies, illness or other experience assessment, disease symptomatology, and in individual and family adaptation (Lipinski, Lipinski, Biesecker & Biesecker, 2006; Sorenson, Janusek & Matthews, 2006). MS is known for being unpredictable in terms of symptom manifestation, disease manifestation and neurological deficit. The period from initial symptom onset to diagnosis may take years and even then, those with MS cannot know with any certainty when and how their disease will progress as well as what symptoms will plague them. Uncertainty is so pandemic in MS that different types of uncertainty, described here

as *symptom uncertainty*, *medical uncertainty*, and *daily living uncertainty*, have been used to classify patient experiences (McHenry, Allen, Mishel & Braden, 1993).

Symptom uncertainty is an experience felt by those with MS on an ongoing basis. Those with MS report a variety of symptoms that may occur independently and in conjunction with one another. Some of the commonly reported symptoms include tingling, weakness, fatigue, visual disturbances, numbness, urinary incontinence, muscle spasticity, depression and depressive symptoms, problems with concentration and attention span, altered abstract and concrete reasoning, and memory lapse (NINDS, 2008; Multiple Sclerosis, 2006; Institute of Medicine[IOM], 2001). The unpredictable course of MS and a lack of pattern manifestation in terms of remission and exacerbation occurrence often result in feelings of anxiety and uncertainty (McReynolds, Koch & Rumrill, 1999).

Medical uncertainty encompasses the complicated process involved in diagnosing MS. While use of the McDonald Criteria is believed to make the process easier and more efficient, the individual must have already endured evidence of at least two distinct episodes of symptoms that occurred at least two months apart for greater than 24 hours and involving at least two parts of the brain and spinal cord. A lack of one tool for clinical diagnosis, incidents of delayed and misdiagnosis remain a problem for those with MS (Polman, 2008). Nicolson and Anderson (2001) found the waiting period between symptom onset and MS diagnosis was associated with feelings of fear, uncertainty and distress.

Daily living uncertainty involves the feelings of fear and concern associated with the unpredictable course and symptoms of MS faced by those with MS face on a daily basis. While individuals with MS have a normal life expectancy (NMSS, 2013), they face an erratic and

progressive disease process that will repeatedly manifest itself and contribute to their susceptibility to other health problems including infections and emboli. McReynolds, Koch and Rumrill (1999) found those with MS had feelings of fear related to disease progression and an anxiety-provoking sense of uncertainty about their future.

The role of uncertainty has been examined in MS. Uncertainty has been associated with an increased sense of danger, diminished learned resourcefulness, poorer quality of life and increased levels of stress (Mishel, 1988; 1993; Braden, 1993; Funk, Tournquist, Champagne & Wiese, 1993; Sorenson, Janusek, & Matthews, 2006; Mishel & Braden, 1988). McNulty and colleagues (2004) found uncertainty was associated with psychosocial adjustment and high levels of perceived uncertainty were inversely associated with lower levels of adaptation. Increased uncertainty has been associated with disease exacerbation and has been identified as a mediator between individual illness state and depression levels (Kroencke et al., 2001; Lynch et al., 2001). Sorenson, Janusek and Matthews (2006) found perceived stress levels and uncertainty were correlated with symptom manifestation outside of disease exacerbation in an MS population. Uncertainty has been associated with periods of stress, exacerbation, and anxiety regarding what is to come (McReynolds et al., 1999; Janssens et al., 2006; Irvine et al., 2009; Mohr & Cox, 2001).

Uncertainty is an important variable in those with MS that can be felt on a daily basis. While Kroencke and colleagues (2001) found uncertainty was a mediating variable for quality of life, they recommended further research. McNulty, Livneh and Wilson (2004) indicate uncertainty in conjunction with ambiguity, compromised coping resources and poor adaptation may result in poorer quality of life. Uncertainty may be positively or negatively associated with

quality of life differently among those with MS depending on variables such as depression, fatigue and declines in cognitive function.

Declines in Cognitive Function, Self-Management and Quality of Life

Cognition refers to the process of thought in knowing while cognitive processes are involved in obtaining and storing knowledge. Cognition and cognitive processes refer to all of the high-level brain processes including a) learning and remembering information; b) attention; and c) organizing, planning, and problem solving. Generally speaking, declines in cognitive function have been associated with traumatic brain injury, normal aging processes, and altered illness and disease states such as diabetes and brain tumors (Till, Colella, Verwegen & Green, 2008; Bruce, Davis, Casey et al., 2009; Deary, Corley, Gow et al., 2009; Park & Schwarz, 2012). In MS, declines in cognition are caused by the destruction of myelin and lesion formation disrupts impulse conduction between the central nervous system and the peripheral nervous system, interrupting nerve signal transmission and damaging nerve fibers (Accelerate Cure Project for Multiple Sclerosis, 2006; NMSS, 2007b).

Harper and colleagues (2003) indicate that declines in cognitive function will befall approximately 60% of those with MS. In MS, declines in cognitive function are primarily seen in the following ways: 1) Learning is compromised as individuals have increasing difficulty in recalling new information and information processing speed; 2) Visuospatial ability deficits; 3) Executive functions such as reasoning, problem solving and planning, attention and concentration; and 4) Information processing resulting in difficulty performing multiple tasks, slowing mental processes and increased distractibility (IOM, 2001; Compston, 2006; Koopman, 2006; NMSS, 2007a; NMSS, 2007b; Harper et al., 2003; Wilken, Sullivan & Wallin et al.,

2008). The National Multiple Sclerosis Society (2007b) indicates that while the mild and moderate declines in cognitive function faced by the majority are considered common, approximately 5-10% are severe and associated with disease duration. The Institute of Medicine (2001) reports declines in cognitive function begin within five years of disease onset and increase with greater disease chronicity. However, there is little systematic evidence to indicate patients are aware of the decline (Compston, 2006; Lester, Stepleman & Hughes, 2007). Declines in cognitive function have been directly associated in altered working memory, difficulty sustaining attention and in performing tasks that involve reasoning, problem solving and planning in studies involving MS populations (Compston, 2006; Koopman, 2006; NMSS, 2008; Wilken, Sullivan & Rogers, et al., 2008).

Self-management refers to one's ability to effectively take care of oneself or the ability to learn how to do so through interventions. Assessing and predicting declines in cognitive function, as well as coping with MS, is difficult for a variety of reasons. The presence of motor or visual dysfunctions, both common to all types of MS and seen throughout disease progression, can result in reduced reaction times and processing speeds, inappropriately indicating cognitive changes. Hallmark symptoms seen in MS, such as depression and fatigue, are often associated with changes in cognitive performance beyond the cognitive alterations brought on by structural changes elicited by lesion formation and neuronal damage. These symptoms can interfere with activities of daily living as well assessments regarding one's ability to cope. Declines in cognitive function could impact not only patient coping but nursing interventions as well. Cognitive impairment has been associated with difficulty in performing activities of daily living (ADLs) and instrumental activities of daily living (IADLs), increased disability, increased

unemployment within ten years of disease onset, diminished social interactions and reduced quality of life (Wilken, Sullivan & Wallin, et al., 2008; Harper, Kennedy & Miller, et al., 2003).

Coping and Quality of Life

Coping has been used in various ways including to describe whether a process is adaptive or non-adaptive, as a mediating factor in chronic disease and adaptation, and as a variable of interest in individual models serving as antecedent, mediator and consequence (Lode, Larsen & Brue et al., 2007; Lazarus, 2000). Lazarus' (2000) approach to coping (and stress) involves recognizing the relational meaning that an individual constructs from the person-environment relationship and knowing that coping is part of an emotion and not a whole system. Montel and Bungener (2007) identified two coping strategies: problem-focused coping, which actively attempts to impact, change, or overcome the difficulty and emotion-focused coping, which aims to reduce the negative emotions associated with the stressor. Examples of problem-focused coping might include information seeking or proactive behaviors while examples of emotion-focused coping might include seeking social support or adopting emotions of denial or extreme optimism.

The findings related to how the two types of coping strategies impact QOL in MS are mixed. Aitkens, Fischer, Namey and Rudick (1997) found a positive relationship between problem-focused strategies, but not for emotion focused coping, and QOL. Montel and Bungener (2007) observed both coping strategies were predictors of QOL. Lode and colleagues (2007) found in the early stages of MS and during exacerbations, individuals with MS relied on emotion-focused coping strategies while problem-focused coping strategies were prevalent in patients who had MS for several years. Lazarus (2000) cautions researchers against comparing

the efficacy of the two coping strategies, indicating both strategies are necessary and in effect, work towards adaptational outcomes. Chalk (2007) included evidence of this relationship in her literature review, noting that emotion-focused strategies such as acceptance have been positively associated with QOL outcomes just as problem-focused coping strategies have been positively associated with psychological well-being. Given these findings, both coping strategies will be measured and examined.

Summary

In this chapter, information was provided to the reader regarding the possible triggers for MS, highlighting that MS is not caused by just one factor. The pathophysiology of MS was outlined for the reader, including how inflammation, neuronal damage and an inappropriate immune response result in a degenerative process within the CNS. The reader was introduced to the different disease courses as well as the reality that patients with MS can expect to experience more than one form of the disease during their lifetime. Finally, a review of the literature was presented with emphasis given to depression, fatigue, uncertainty, coping, self-management and quality of life in MS. In the next chapter, the study methods will be introduced.

CHAPTER III: METHODS

The methods that were used in this research study will be described in this chapter. The purpose of this descriptive cross sectional study was to: 1) describe the relationships among common signs/symptoms (depression, fatigue, declines in cognitive function) in women with Multiple Sclerosis (MS) using a modified version of Braden's Self Help Theoretical Model, and 2) evaluate whether depression, fatigue, declines in cognitive function, uncertainty, enabling skills (self-control in this study) and self-management (coping in this study) influence quality of life outcomes in women with MS. The findings of this study will be used to provide a foundation for future research and to aid in the generation of interventions aimed at improving quality of life in those with MS.

Study Design

This study used a cross sectional descriptive design. The rationale was because it was the most effective model to explore whether relationships exist among the variables (depression, declines in cognitive function, fatigue, uncertainty, self-control and coping) of interest.

Sample

The sample recruited for this study was 215 women with MS for a final sample of 106 participants. Although only a final sample of 80 was needed, the researcher oversampled to account for missing data and was surprised there were minimal missing data. Response rate to these mailed surveys was 49% instead of the approximate 30% anticipated, yielding 106 usable questionnaires.

Inclusion Criteria: 1) A diagnosis of MS; 2) being female; 3) ability to read and understand English; 4) willing and able to complete questionnaires; 5) over the age of 21; and 6)

within ten years of diagnosis. The reason for accepting patients who were within ten years of diagnosis was there have been new medication treatment modalities introduced in the last decade.

Exclusion Criteria: Diagnosis before the age of 21. The rationale for excluding individuals who were diagnosed before the age of 21 was there are some differences in symptoms (e.g., seizures and lethargy are seen in pediatric MS) and disease course (e.g., children may see a slower disease course but higher disability at an earlier age) (NMSS, 2013).

Participants were not excluded based on age or ethnicity.

Data Collection Procedures

Recruitment

To obtain participants for the study, the investigator recruited with assistance from The Consortium of MS Centers. The Consortium was willing to send the investigator's cover letter and questionnaires (see Appendices I-IX) to members in the North American Research Committee on Multiple Sclerosis (NARCOMS) registry. The NARCOMS is a global registry for MS research, treatment and patient education that contains an active database of over 37,000 persons with MS. The registry is designed to allow Consortium staff to access the registry and obtain potential participant's names and addresses that met the investigator's specific criteria. At no time was the investigator given the names and addresses of the 215 participants that were recruited. The questionnaires were sent out to members who met the inclusion criteria living in the following states: Arizona, California, Nevada and New Mexico. The researcher received the necessary sample; a second mailing by The Consortium was not needed.

Questionnaires were not identified by participant name, but by a subject identification number. No identifying information was on the questionnaires. Questionnaires could be completed in sixty to seventy-five minutes. The questionnaires were returned to the investigator in the self-addressed stamped envelope provided to each participant. There was no identifying information on the envelope and the return address was the investigators.

Human Subjects Protection

This study received approval by the Institutional Review Board of The University of Arizona prior to conducting the study. Information about the study was provided in each packet for each potential participant (Appendix I). The information sheet clearly outlined that personal identifiers would not be collected and anonymity was assured.

Questionnaires were labeled with subject ID numbers upon receipt by the investigator. The label and return address on the self-addressed stamped envelope was the investigator's to prevent any breach of confidentiality or link to the participant. Despite these measures, the investigator did receive three envelopes on which the participant had placed her own return address on top of the investigators. To prevent a breach in confidentiality, the researcher immediately removed that portion of the envelope and shredded it.

Measurement

Demographic and Illness Characteristics that were collected include: Current age in years, age at diagnosis, age at symptom onset, form of disease at diagnosis if known, current form of disease if known, and employment status. Personal identifiers (e.g., name and address) were not collected. However, the researcher did receive several hand-written comments by participants within the returned surveys.

The subscales of the Multiple Sclerosis Quality of Life Inventory (MSQLI) that were utilized in this research were the *Modified Fatigue Impact Scale,* the *Perceived Deficits Questionnaire,* and the *SF-36 Health Status Questionnaire (SF-36).* The MSQLI is a battery of ten individual scales providing quality of life measures that are MS-specific as well as generic (Fischer, 1999). Five of the ten subscales have both a standard and short form version, with the entire test taking less than 45 minutes. The MSQLI consists of a set of ten self-report questionnaires, with each test generating a separate score. As there is no global composite combining the scores, researchers can utilize only the subscales desired. Overall, the MSQLI has good internal consistency reliability and good test-retest reliability (NMSS, 2007). Good content validity for the MSQLI was ensured by the mode of development, which was designed to develop health-related QOL measures specifically for MS patients.

Fatigue was measured using the *Modified Fatigue Impact Scale (MFIS),* a subscale of the MSQLI. The MFIS measures fatigue in terms of physical, cognitive and psychosocial functioning and was derived from interviews with MS patients concerning the impact fatigue plays in their lives. There is a full and abbreviated version of the form. The full version, containing 21 items, was intended for use in this study. The scale can be used to form one total MFIS score or aggregated into three subscales. Higher scores indicate a greater impact of fatigue on a patient's activities on a range of 0-84. The MSQLI (1997) reports the reliability of the MFIS using Cronbach's (alpha) at .81 for the full version of the questionnaire. Unfortunately, questions 20 and 21 were left off the sent surveys, necessitating the investigator use the abbreviated version of the MFIS, which utilizes questions 1, 9, 10, 17 and 19 from the full version. The abbreviated version, containing five items, has a range of 0-20 with a higher score indicating a

greater impact of fatigue on a patient's activities. The MSQLI (1997) reports a reliability of the MFIS using Cronbach's (alpha) at .80 for the abbreviated version of the questionnaire.

Cognitive functioning was measured using the *Perceived Deficits Questionnaire (PDQ).* Sullivan and colleagues (1990) developed the PDQ specifically for MS in order to provide a self-report measure of cognitive dysfunction. The PDQ consists of 20 items and takes approximately 5-10 minutes to complete. A self-report questionnaire, the PDQ provides an assessment of several domains of cognitive functioning that are frequently affected in MS: attention, retrospective memory, prospective memory, and planning and organization. The PDQ scale score can range from 0-80 and the higher the score, the greater the perceived cognitive impairment. The MSQLI (1997) reports the reliability of the scale using Cronbach's (alpha) at .93 for the full version of the questionnaire.

Depression was measured using the *Patient Health Questionnaire-9 (PHQ-9).* The PHQ-9 is a nine-item self-administered instrument which scores each of the 9 DSM-IV criteria as "0" (not at all) to "3" (nearly every day) (Kroenke, Spitzer & Williams, 2001). Based on the diagnostic criteria for major depressive disorder outlined in the 4th edition of the Diagnostic and Statistical Manual, the PHQ-9 can facilitate diagnosis of major depression and assessment of symptom severity. Scores range from 1 to 27 with scores greater than 10 indicating moderate depression and scores greater than 20 indicating severe depression. Kroenke and colleagues (2001) report internal reliability at 0.86 in their OB-Gyn study and 0.89 in their Primary Care Study.

Uncertainty was measured using the *Mishel Uncertainty in Illness Scale- Adult* (MUIS-A) [1981]. Mishel (1988) defines uncertainty as: 1) the inability to determine meaning in illness-

related events, and 2) a cognitive state that occurs when insufficient cues exist to enable individuals to accurately predict outcomes or structure events. First developed in English, the MUIS-A is a five point Likert-type scale containing thirty questions and has high internal consistency. Initially developed to measure uncertainty as experienced by hospital patients, the MUIS-A measures uncertainty related factors: ambiguity, complexity, inconsistency, and unpredictability. Mishel (1981) indicates that a cognitive structure is the patient's subjective evaluation of an illness, treatment, and /or hospitalization experience and influences decision-making and resultant performance. Used in chronic and life-threatening diseases, the MUIS-A focuses on uncertainty as impacting one's ability to act, limiting one's ability to appraise a situation (Buhr & Dugas, 2004). Wineman (1990) used the MUIS-A in a study in MS investigating the role of social support, disability and perceived uncertainty. Kroencke and colleagues (2001) studied the importance of uncertainty in depression during exacerbations in a MS population. Using the MUIS-A, they found that uncertainty was a significant predictor of depression ($r=.49$ $P < .001$). Cronbach's alpha values of .83 and .92 have been reported in studies involving patients with various acute and chronic illnesses (LeFort, 2000; Tsao et al., 2002).

Enabling skills (self-control in this study) was measured using the 20 item modified version of Rosenbaum's (1980) *Self-Control Scale* (SCS). The SCS is a self-report scale that asks subjects to consider a set of situations and answer how they manage each. The 10-mm horizontal line visual analogue scale response format ranges from 1 (not true about me) to 10 (true about me) with scores ranging from 20 to 200. A higher score is indicative of a greater level

of enabling skills by the individual. The internal consistency of the scale using Cronbach's alpha values range between .74 and .95 (Chuang, Lin & Gau, 2010).

Self-management (coping in this study) was measured using the *COPE Inventory-Brief.* Carver (1997) reports the COPE Inventory-Brief was created from the longer version of the form due to the impatience expressed by patient samples. The overall purpose of the COPE is to assess a broad range of coping responses. While the longer version has over 60 questions, the brief version contains only 28 questions that are answered on a four-point Likert scale. The scale ranges from the participant not having been doing something at all to doing it a lot. Coping is the sum of the 28 items ranging from 0-84. Adaptive coping is the sum of 16 adaptive items with scores ranging from 0-48 and maladaptive coping is the sum of 12 maladaptive items with scores ranging from 0-36 (Carver, 1997). Examples of adaptive coping strategies are active coping, planning and positive reframing while examples of maladaptive strategies include denial, self-distraction, and substance abuse. Higher scores on a particular scale indicate the participant uses that coping style more frequently. Walker and colleagues (2006) report reliability and validity of the scale indicating acceptable Cronbach's alpha values in both adaptive coping ($\alpha = .85$) and maladaptive or less adaptive coping ($\alpha = .76$).

Quality of Life (QOL) was measured using the *SF-36 Health Status Questionnaire (SF-36).* The SF-36 was developed from the General Health Survey of the Medical Outcomes Study. One of the most widely used generic measures of health-related QOL, the SF-36 is capable of discriminating between subjects with different chronic conditions and between subjects' disease severity levels. The SF-36 demonstrates sensitivity to significant treatment effects in a variety of populations and addresses concepts that are relevant to MS patients from their perspective. The

scale breaks down into eight parts and generates two summary scores: a physical component summary and a mental component summary. Ware and colleagues reported reliabilities of .92 and .91 respectively for the physical and mental components (as reported in the MSQLI manual, 1997). The scale takes less than ten minutes to complete and can be utilized independently or in conjunction with other measures to help inform the researcher how variables like fatigue and cognition may affect QOL in MS.

Data Analysis

This research seeks to explore the following questions: 1) What are the relationships between depression, fatigue and declines in cognitive function? 2) Are there any relationships between these variables and uncertainty? 3) Does uncertainty affect enabling skills (self-control in this study) and self-management (coping skills in this study)? 4) Do declines in cognitive functioning have an effect on enabling skills (self-control in this study) and self-management (coping skills in this study)? 5) Is there a relationship between enabling skills and self-management? 6) What influence do uncertainty, enabling skills and self-management have on quality of life? 7) How do these variables (depression, fatigue and declines in cognitive function) influence quality of life?

TABLE 1. *Concepts, Measures, Items, Questions Addressed and Cronbach's Alpha*.

Concept	Measure	Number of Items	Questions Addressed	Cronbach's Alpha
Fatigue	Modified Fatigue Impact Scale	5	1 and 2 and 7	.85
Depression	Patient Health Questionnaire-9	9	1 and 2 and 7	.85
Cognitive Functioning	Perceived Deficits Questionnaire	20	1 and 2 and 4 and 7	.80-.85
Uncertainty	Mishel Uncertainty in Illness Scale- Adult	33	2 and 3 and 6	.85
Enabling Skills: Self-Control	Self- Control Scale	20	3 and 4 and 5 and 6	.69
Self-Management: Coping	COPE Inventory-Brief	28	3 and 4 and 5 and 6	.69
Quality of Life	SF-36 Health Status Questionnaire	36	6 and 7	.91 (PCS) .91 (MCS)

Table 1 lists the concepts, measures, number of items and questions addressed during analysis. It also contains the Cronbach's alpha derived with reliability analyses performed during the study. The investigator used descriptive statistics to describe the sample. Aim One of the study was to describe the relationships among common signs/symptoms (depression, fatigue, declines in cognitive function) in women with MS. The investigator used correlations to describe the relationships. Questions 1, 2, and 5 were also addressed using correlations. Aim Two of the study was to evaluate whether depression, fatigue, declines in cognitive function, uncertainty, enabling skills and self-management influence quality of life outcomes in women with MS. The investigator used simple regression for the analysis of Aim Two. Simple regression was also used to help answer questions 3, 4, 6, and 7 listed above. This type of regression was used

because the investigator was not seeking to predict whether the independent variables (depression, fatigue, cognitive functioning) predicted the incidence of other variables such as uncertainty and coping.

Summary

In this chapter, the methods the investigator used to complete the dissertation study were discussed. The investigator used a descriptive cross sectional study design. There were 215 women recruited and asked to complete one demographic form and seven questionnaires. In the end, 106 completed surveys (49%) were used in the analysis. The participants are members of the NARCOMS registry who reside in the southwest United States and were recruited through The Consortium of MS Centers. Descriptive statistics and simple regression analysis were used to evaluate the data collected and will be discussed in the next chapter.

CHAPTER IV: RESULTS

The purpose of this study was to describe the relationships among common signs/symptoms (depression, fatigue, declines in cognitive function) in women with multiple sclerosis (MS) using a modified version of Braden's Self Help Theoretical Model and evaluate whether depression, fatigue, declines in cognitive function and uncertainty, enabling skills (self-control in this study) and self-management (coping in this study) influence quality of life outcomes in women with MS. In this chapter the study sample are described and the results for each research aim are reported.

Description of the Sample

In this study, 215 surveys were mailed to potential participants who met the inclusion criteria outlined in chapter three. Of the 215 surveys sent, 107 were returned. One of those surveys needed to be removed from the data analysis because the participant did not meet the inclusion criteria as her diagnosis was received before the age of 21 years and she was not within ten years of diagnosis.

Table 2 provides general demographic characteristics about the 106 subjects whose completed surveys were used in the analysis. The mean current age of the female participants was 48.5 years of age with the youngest respondent aged 25 and the oldest respondent aged 64. At diagnosis, the mean age for the participants was 41.6 years with approximately 42% being diagnosed between the ages of 40 and 50. Participants reported having their first symptoms on average at 34.0 years of age with 60% reporting symptom onset between the ages of 21 and 41 years.

Of the 101 participants who knew their disease course at diagnosis, 92% (N=93) reported being diagnosed with relapsing remitting MS (RRMS). Of the 93 participants who reported having RRMS at diagnosis, eight of those participants reported that they now had secondary progressive MS (SPMS), which is also consistent with the disease course. One of the two individuals who reported having an initial diagnosis of SPMS, reported having symptom onset almost 30 years before receiving a diagnosis of MS.

TABLE 2. *Demographic Characteristics of Participants (N=106)*

Characteristic	**n**	**Mean**	**%**
Current Age	106	48.5	
Age at Diagnosis	106	41.6	
Age 1st Symptoms	99	34.0	
Disease Subtype at Diagnosis	101		
Relapsing Remitting			92
Secondary Progressive			2
Primary Progressive			5
Progressive Relapsing			1
Disease Subtype Currently	103		
Relapsing Remitting			79.6
Secondary Progressive			9.7
Primary Progressive			8.7
Progressive Relapsing			1.9
Current Employment Status	106		
Employed			44.3
Unemployed			16
Retired			7.5
Disabled			32.1

Forty four percent of participants were still employed while the remainder was either unemployed (16%), retired (7.5%), or disabled (32.1%). Two of the participants, one who marked unemployed and one who marked retired, also wrote in that they were disabled but were categorized by the box checked.

Results

Specific Aim One: To describe the relationships among common signs/symptoms (depression, fatigue, declines in cognitive function) in women with multiple sclerosis.

Table 3 presents descriptive data for depression, declines in cognitive function and fatigue for the 106 participants. Depression was measured using the Patient Health Questionnaire-9 (PHQ-9). The mean depression score was 8.14 which indicated mild depression. Declines in cognitive function were measured using the Perceived Deficits Questionnaire (PDQ). The mean score was 31.6, which indicates this sample perceived mild declines in cognitive function.

TABLE 3. *Means, Standard Deviations and Range for Depression, Declines in Cognitive Function and Fatigue (N= 106)*

Variable	Mean	Standard Deviation	Range
Depression	8.14	5.72	0-22
Declines in Cognitive Function	31.61	18.45	0-79
Fatigue	10.29	5.54	0-20

Fatigue was measured using the Modified Fatigue Impact Scale (MFIS). Due to an error in the generation of the surveys, questions 20 and 21 were left off of the MFIS-21 point questionnaire. Five questions (1, 9, 10, 17 and 19) were used as a subscale in the analysis. The mean fatigue subscale score was 10.29, which indicates the sample had moderate fatigue.

Question 1: What are the relationships between depression, fatigue and declines in cognitive function? Table 4 presents the correlations found among the three variables.

TABLE 4. *Correlations for Depression, Declines in Cognitive Function and Fatigue (N=106)*

Variable	**1**	**2**	**3**
1. Depression	—	.66**	.66**
2. Declines in Cognitive Function	.66**	—	.67**
3. Fatigue	.66**	.67**	—

Note. ** $p < .01$.

A strong positive significant relationship ($r = .66$, $p = .00$) was found between depression and fatigue, with participants with higher depression reporting greater fatigue. A strong positive significant relationship ($r = .66$, $p = .00$) was found between depression and declines in cognitive functioning. Participants with higher depression had higher perceived declines in cognitive functioning. A similar relationship ($r = .67$, $p = .00$) was found between fatigue and declines in cognitive function. Participants with higher fatigue had higher perceived declines in cognitive function. There were significant positive relationships found between depression, declines in cognitive function and fatigue indicating that higher rates of depression will accompany higher rates of fatigue and higher perceived declines in cognitive function.

Question 2: What are the relationships between depression, fatigue, declines in cognitive function and uncertainty? The mean total Mishel's Uncertainty in Illness score was 85.48 (*SD*= 11.9, *Range*= 47-116) indicating moderate uncertainty in this sample. Table 5 presents correlations for depression, fatigue, declines in cognitive functioning and uncertainty.

TABLE 5. *Intercorrelations for Depression, Declines in Cognitive Function, Fatigue and Uncertainty (N=106)*

Variable	**1**	**2**	**3**	**4**
1. Depression	—	.66**	.66**	.51**
2. Declines in Cognitive Function	.66**	—	.67**	.43**
3. Fatigue	.66**	.67**	—	.56**
4. Uncertainty	.51**	.43**	.56**	—

Note. ** $p < .01$.

A moderate positive significant relationship was found between depression and uncertainty with greater depression associated with greater uncertainty. A moderate positive significant relationship was found (r = .43, p = .00) between declines in cognitive function and uncertainty. Participants with higher perceived declines in cognitive function had greater uncertainty. A moderate positive significant relationship was found (r = .56, p = .00) between fatigue and uncertainty. Participants with higher rates of fatigue had greater uncertainty. Thus, higher depression, greater declines in cognitive functioning and more fatigue were all significantly associated with greater uncertainty. When examining if depression, fatigue and declines in cognitive function could predict uncertainty, fatigue was found to predict 30% of the variance on uncertainty, F (1,104) = 47.7, p= .00, with depression adding an additional 3% of the variance on uncertainty, F (2,103) = 27.5, p = .00. This indicates that 30% of the differences in uncertainty in the respondents is attributable to fatigue (as opposed to by chance alone) and 33% of the differences in uncertainty is attributable to fatigue and depression.

Question 3: Does uncertainty affect enabling skills (self-control in this study) and self-management (coping in this study)? Table 6 presents descriptive data for self-control, maladaptive coping and adaptive coping for the participants. Self-control scores range from 20-200 with higher scores indicating higher self-control by the respondent. The mean self-control score (SCS) was 142.04 with a minimum reported score of 51 and a maximum reported score of 200.

TABLE 6. *Means, Standard Deviations and Range for Self-Control, Adaptive Coping, Maladaptive Coping (N= 106)*

Variable	Mean	Standard Deviation	Range
Self-Control	142.04	30.25	51-200
Adaptive Coping	24.45	9.82	0-47
Maladaptive Coping	9.25	4.87	0-21

Adaptive coping scores range from 0-48 with higher scores indicating higher adaptive coping skills. The mean adaptive coping score was 24.45 (indicative of a moderate amount of adaptive coping skills) with a minimum score of zero and a maximum score of 47. Maladaptive coping skills range from 0-36 with higher scores indicating higher maladaptive coping skills. The mean maladaptive score was 9.25 (mild use of maladaptive coping skills) with a minimum score of zero and a maximum score of 21.

Table 7 presents the correlations between uncertainty, maladaptive and adaptive coping as well as self-control scores.

TABLE 7. *Intercorrelations for Uncertainty, Self-Control, Maladaptive Coping and Adaptive Coping (N=106)*

Variable	1	2	3	4
1. Uncertainty (N = 107)	—	.23*	.40**	.08
2. Self-Control (N = 105)	-.23*	—	-.19	.45**
3. Maladaptive Coping (N = 106)	.40**	-.19	—	.33**
4. Adaptive Coping (N = 106)	.08	.45**	.33**	—

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

Higher levels of uncertainty were weakly negatively associated with self-control scores (r = -.23, p = .02), indicating that uncertainty does not strongly predict self-control. Derived from regression analysis, the one-way ANOVA, $F(1,102) = 5.64$, p = .02, demonstrated that only 4% of the variance on self-control scores was explained by uncertainty. Uncertainty was moderately positively correlated with maladaptive coping skills (r =.40, p = .00). Participants with higher

uncertainty had higher maladaptive coping scores. Furthermore, 15% of the variance on maladaptive coping scores can be explained by higher uncertainty with F (1,103)= 19.8, p = .00. This indicates that 15% of differences in maladaptive coping scores can be explained by higher uncertainty. In summary, uncertainty was not a strong predictor of enabling skills (self-control in this study) or self-management (coping in this study).

Question 4: Do declines in cognitive functioning have an effect on enabling skills (self-control in this study) and self-management (coping in this study)? Table 8 presents the correlations between declines in cognitive functioning, self-control scores, adaptive coping scores and maladaptive coping scores. Higher perceived declines in cognitive function was only weakly and negatively associated with self-control scores (r = -.19, p = .06). Participants with higher perceived declines in cognitive function had lower self-control scores.

TABLE 8. *Intercorrelations for Declines in Cognitive Functioning, Self-Control, Maladaptive Coping and Adaptive Coping (N = 106)*

Variable	**1**	**2**	**3**	**4**
1. Declines in Cognitive Function	—	-.19*	.39	.08
2. Self-Control	-.19*	—	-.19	.45**
3. Maladaptive Coping	.39**	-.19	—	.33**
4. Adaptive Coping	.08	.45**	.33**	—

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

Declines in cognitive function were not significantly associated with adaptive coping skills. A weak positive relationship (r = .39, p = .00) was found between declines in cognitive function and maladaptive coping skills. Derived from regression analysis, the one way ANOVA, F(1,103) = 18.04, p = .06, indicated 14% of the variance on maladaptive coping is predicted by declines in cognitive function. Participants with higher perceived declines in cognitive functioning used more maladaptive coping skills.

Question 5: Is there a relationship between enabling skills (self-control in this study) and self-management (coping in this study)? Table 9 presents the correlations between self-control scores, adaptive coping scores and maladaptive coping scores. A moderate positive relationship (r = .45, p = .00) was found between self-control scores and adaptive coping scores. Participants who reported higher self-control scores also reported higher adaptive coping scores. The relationship between self-control and maladaptive coping scores was not significant.

TABLE 9. *Correlations for Self-Control, Maladaptive Coping and Adaptive Coping (N=106)*

Variable	**1**	**2**	**3**
1. Self-Control	—	-.19*	.45**
2. Maladaptive Coping	-.19*	—	.33**
3. Adaptive Coping	.45**	.33**	—

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

A weak but positive relationship (r = .33, p = .00) was found between adaptive coping scores and maladaptive coping scores indicating that these two coping methods are not mutually exclusive. Participants used both adaptive and maladaptive coping methods. Participants who had higher adaptive coping scores also had higher maladaptive coping scores.

In summary, the purpose of specific aim I was to describe the relationships among depression, fatigue and declines in cognitive function in women with MS. Strong positive relationships existed between depression, cognitive function and fatigue and moderate positive relationships between higher depression, greater declines in cognitive functioning, higher fatigue and uncertainty. Declines in cognitive functioning were not a strong predictor of enabling skills or self-management. Uncertainty was moderately associated with maladaptive coping but was not a strong predictor of enabling skills or self-management. Moderate positive relationships

existed between enabling skills and adaptive coping skills and adaptive coping skills and maladaptive coping skills.

Specific Aim Two: To evaluate whether depression, fatigue, declines in cognitive function and uncertainty, enabling skills (self-control in this study) and self-management (coping in this study) influence quality of life outcomes in women with multiple sclerosis.

Quality of life (QOL) is indicated by the physical components summary score (PCS) and the mental components summary score (MCS) from the eight subscales of the SF-36: Physical Functioning (PF), Role-Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role-Emotional (RE) and Mental Health (MH). The descriptive statistics for those subscales are in Table 10. The higher the PCS or MCS score, the greater the QOL. In contrast, the lower the PCS or MCS score, the lower the QOL. Due to missing data in some of the 106 participants SF-36, PCS and MCS scores were obtained for 68 participants and are contained in Table 10.

TABLE 10. *Means, Standard Deviations and Range for SF-36 Scales (N=68)*

Variable	Mean	Standard Deviation	Possible Range	Actual Range
PF Scale	59.66	32.20	0-100	5-100
RP Scale	38.72	39.58	0-100	0-100
BP Scale	59.33	25.16	0-100	0-100
GH Scale	54.93	24.15	0-100	10-100
VT Scale	35.24	20.34	0-90	0-80
SF Scale	62.63	29.59	12.5-100	0-100
RE Scale	59.93	42.66	0-100	0-100
MH Scale	67.25	20.81	0-100	12-100
PCS*	39.57	12.06	13.6-61.9	14.95-60.54
MCS*	45.37	10.94	15.6-70.0	22.49-61.82

Note. * These scales are not simple linear composite scales but are factor scales derived from a Principal Components analysis.

The mean MCS score for the participants (*SD= 10*.9, *Range*= 15.6-70.0) was 45.37, with a minimum score of 22.49 and a maximum score of 61.82. The mean PCS score for the participants (*SD*= 12.1, *Range*= 13.6-61.9) was 39.57, with a minimum score of 14.95 and a maximum score of 60.54.

Question 6: What influence do uncertainty, enabling skills (self-control in this study) and self-management (coping in this study) have on quality of life? Table 11 contains the correlations found among uncertainty, adaptive and maladaptive coping scores, self-control scores, and the physical components summary scores (PCS) and mental components summary scores (MCS).

TABLE 11. *Intercorrelations for Uncertainty, Adaptive Coping, Maladaptive Coping, Self-Control, PCS and MCS (N=106)*

Variable	**1**	**2**	**3**	**4**	**5**	**6**
1. Uncertainty	—	.04	.38**	-.24*	-.55**	-.48**
2. Adaptive Coping	.04	—	.36**	.44**	-.13	.15
3. Maladaptive Coping	.38**	.36**	—	-.17	-.22	-.45**
4. Self-Control	-.24*	.44**	-.17	—	.19	.44**
5. PCS	-.55**	-.13	-.22	.19	—	.25*
6. MCS	-.48**	.15	-.45**	.44**	.25*	—

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

A moderately significant negative relationship (r = -.55, p = .00) was found between uncertainty and PCS indicating higher uncertainty was associated with lower physical health. Twenty-five percent of the variance in the physical components summary scores was explained by uncertainty, F (1, 66) = 23.3, p = .00. This indicates that 25% of differences in physical components summary scores were predicted by uncertainty. A moderately significant negative relationship (r = -.48, p = .00) was found between uncertainty and MCS indicating higher uncertainty was associated with lower mental health. Twenty-eight percent of the variance in the

mental components summary scores was explained by uncertainty, F (1, 66) = 27.3, p = .00. This indicates that 28% of differences in MCS were attributable to uncertainty. Participants with higher uncertainty scores had poorer mental health. Participants with higher uncertainty had overall lower quality of life.

A moderate significant relationship (r = .44, p = .00) was found between self-control scores and MCS. Higher self-control scores were associated with higher MCS scores indicating respondents with greater self-control have higher overall mental health. A moderate significant negative relationship (r = -.45, p = .00) was found between maladaptive coping scores and MCS. Higher maladaptive coping scores were found to be associated with lower MCS scores. Respondents who used higher maladaptive coping skills also reported lower mental health.

Question 7: How do depression, fatigue and declines in cognitive function influence quality of life? Table 12 contains the correlations between depression, declines in cognitive function, fatigue and PCS.

TABLE 12. *Intercorrelations for Depression, Declines in Cognitive Function, Fatigue and PCS*

Variable	**1**	**2**	**3**	**4**
1. Depression	—	.67**	.66**	-.44**
2. Declines in Cognitive Function	.66**	—	.67**	- .44**
3. Fatigue	.66*	.67**	—	-.79**
4. PCS	-.44**	-.44**	-.79**	—

Note. ** p < .01.

A moderately significant inverse relationship (r = -.44, p = .00) was found between depression and PCS indicating higher depression was associated with lower physical health. A moderately significant negative relationship (r = -.44, p = .00) was found between declines in cognitive function and PCS indicating higher perceived declines in cognitive function was associated with lower physical health. A strong significant negative relationship (r = -.79, p = .00) was found

between fatigue and PCS indicating greater fatigue was associated with lower physical health. Furthermore, sixty-two percent of the variance in the physical components summary score were explained by fatigue, F (1, 66) = 112.79, p = .000. This indicates that 62% of differences in overall physical health were predicted by respondent fatigue. Higher depression, greater perceived declines in cognitive function and greater fatigue have a negative impact on physical health.

Table 13 contains the correlations between depression, declines in cognitive function, fatigue and MCS.

TABLE 13. *Intercorrelations for Depression, Declines in Cognitive Function, Fatigue and MCS*

Variable	**1**	**2**	**3**	**4**
1. Depression (PHQ-9)	—	.66**	.66**	-.66**
2. Declines in Cognitive Function	.66**	—	.67**	- .59**
3. Fatigue (MFIS 5)	.66**	.67**	—	-.44**
4. MCS	-.66**	-.59**	-.44**	—

Note. ** at $p < .01$.

A strong significant negative relationship (r = -.66, p = .00) was found between depression and MCS. Forty-three percent of the variance in the mental components summary score was explained by depression, F (1, 66) = 51.87, p = .00. Participants with greater depression have poorer mental health. A moderate significant negative relationship (r = -.59, p = .00) was found between declines in cognitive function and MCS. Higher perceived declines in cognitive function were associated with lower MCS. A moderate significant inverse relationship (r = -.44, p = .00) was found between fatigue and MCS. Participants with higher fatigue have lower MCS. Greater depression, higher perceived declines in cognitive function and greater fatigue have a negative impact on mental health.

In summary, the purpose of specific aim II was to evaluate whether depression, fatigue, declines in cognitive function and uncertainty, enabling skills (self-control in this study) and self-management (coping in this study) influence quality of life outcomes in women with MS. Greater uncertainty was associated with lower physical health, lower mental health and poorer quality of life. Higher self-control scores were associated with higher mental health. Higher maladaptive coping scores were associated with lower mental health. Higher depression scores, greater perceived declines in cognitive function and higher fatigue scores were associated with lower physical health, lower mental health and poorer quality of life.

Modified Self-Help Model: An MS Population

In chapter one, the hypothesized relationship of the constructs was presented (Figure 2). The updated figure which reflects the actual correlations from the findings is presented on the following page (Figure 5). While the major findings have already been presented, this provides a visual image of how the different constructs from each stage of Braden's theoretical framework are related. The model includes the significant correlations between the common symptoms of MS contained in stage I as well as the significant correlations between depression, fatigue, declines in cognitive function and uncertainty. It reflects the relationships between uncertainty, self-control and coping. The model also highlights the inverse relationship between Stage I's depression, fatigue and declines in cognitive functioning and Stage V's physical health and mental health.

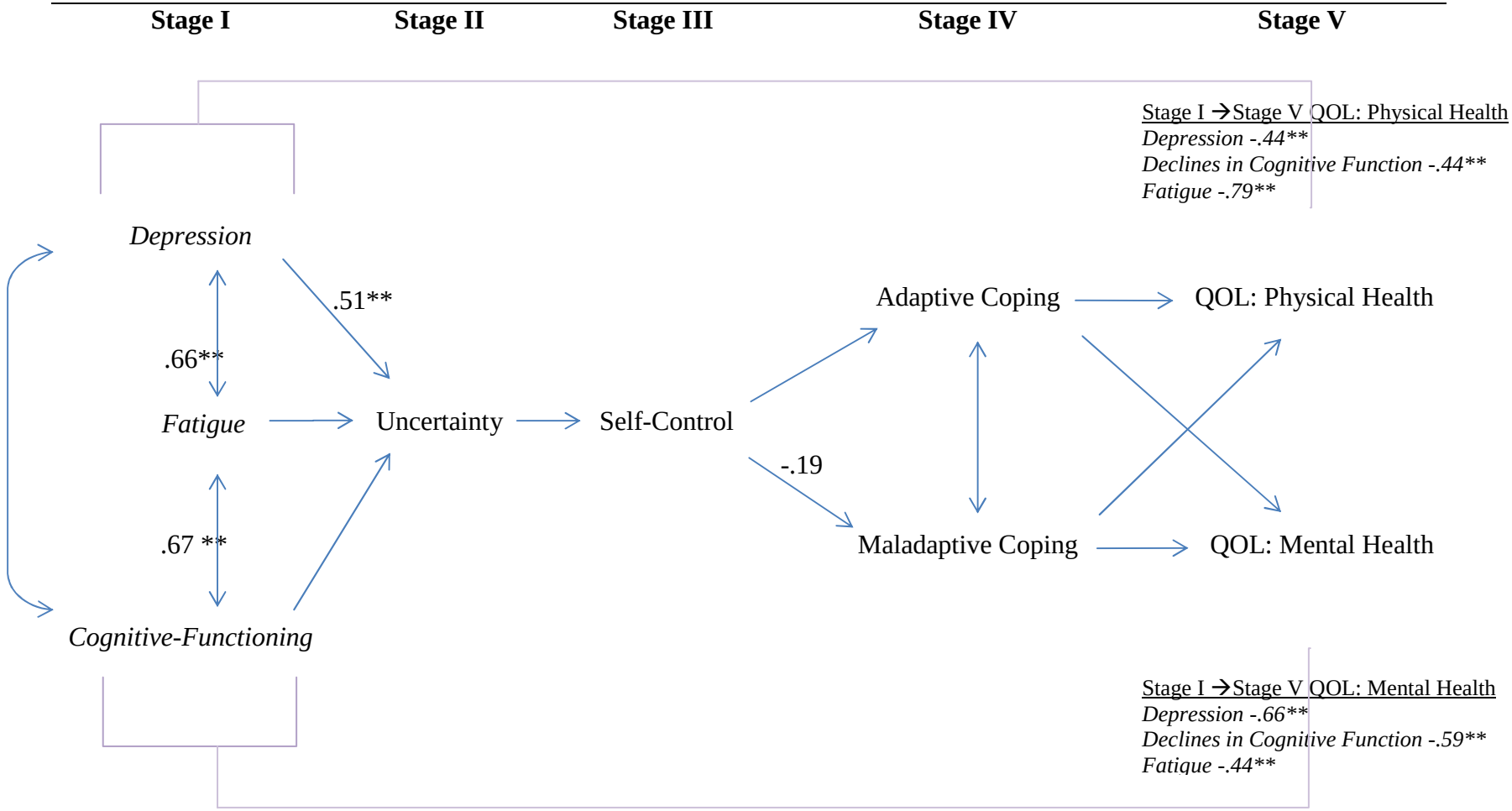

FIGURE 5. Relationship of Constructs in the Modified Self-Help Model: An MS Population

Summary

The major findings for this study were that depression, declines in cognitive function, fatigue and uncertainty, self-control and coping were all associated with each other. As hypothesized in Braden's modified Self-Help Model (Figure 5), a relationship exists between the common signs/symptoms (depression, declines in cognitive function and fatigue) identified in Stage I. A relationship exists between the variables of Stage I and Stage II (identified as *uncertainty* by Braden and retained for this adapted model). A significant relationship was not found between uncertainty from Stage II and the enabling skills of Stage III. However, a relationship does exist between uncertainty and one aspect of Stage IV's self-management, known as maladaptive coping. A relationship does exist between Stage III's enabling skills (known as self-control in this study) and Stage IV's self-management (coping in this study). As hypothesized in Braden's model, the aspects of Stages I, II, III and IV did relate to Stage V, identified as QOL: Physical Health and QOL: Mental Health. These findings are discussed in chapter 5.

CHAPTER V: DISCUSSION

The purpose of this descriptive study was to explore the relationships of common symptoms in women with Multiple Sclerosis (MS) and to explore the use of a modified version of Braden's Learned Response Chronic Illness Self-Help Model (LRCISHM). In this chapter, the study findings are discussed as they relate to the two aims and questions used to guide this study. The strengths and limitations of the study, implications for future nursing research as well as the recommendations for further study are also discussed.

From the two research aims seven questions were generated that helped guide the inquiry for this cross-sectional descriptive study. The findings for each question contained within the two aims will be presented as they relate to each of the two research aims and Braden's LRCISHM.

Discussion Related to Specific Aim One

Specific Aim One: To describe the relationships among common signs/symptoms (depression, fatigue, declines in cognitive function) in women with multiple sclerosis.

Depression, fatigue and declines in cognitive functioning are among the three most common symptoms seen in women with MS (NMSS, 2013; NINDS, 2008; Multiple Sclerosis, 2006; IOM, 2001). Each of these variables is negatively associated with quality of life for this population. Thus, gaining insight into the relationship that exists among these variables is important for developing care and interventions. As predicted, the findings indicated that there was a strong relationship among depression, fatigue, and declines in cognitive function.

Multiple Sclerosis has been described as being unpredictable and previous chapters outlined how uncertainty in MS is so prevalent that several forms of uncertainty have been used to classify patient experiences with MS. Those types of uncertainty were previously identified as

symptom uncertainty, *medical uncertainty* and *daily living uncertainty* and a lack of pattern manifestation in terms of remission and exacerbation occurrence often results in feelings of anxiety and uncertainty (McReynolds, Koch & Rumrill, 1999). Multiple studies have been conducted to examine uncertainty in MS (Irvine et al., 2009; Sorenson et al., 2006; Janssens et al., 2006; Kroencke et al., 2001; Lynech et al., 2001; McHenry et al., 1993) and this study was not an extension of those but an opportunity to evaluate uncertainty using an adapted version of Braden's LRCISHM. In evaluating the relationships among depression, fatigue, declines in cognitive function, there was a relationship among all of these variables and uncertainty. Furthermore, stepwise regression illustrated that among depression, fatigue and declines in cognitive function, fatigue was the greatest predictor of the differences seen in uncertainty.

Enabling skills (self-control in this study) involve problem solving and the use of cognitive reframing resources and a belief in self (Owens, 2007; Braden, 1990b, 1993b). Self-control was used to evaluate enabling skills in this study. Coping was evaluated using the *COPE Inventory-Brief*. The findings within this study indicated adaptive coping and maladaptive coping were positively associated with one another. Furthermore, adaptive coping and self-control were also positively associated with one another.

The study findings indicated that relationships existed among depression, fatigue, declines in cognitive function and uncertainty, enabling skills and self-management in women with MS.

Discussion Related to Specific Aim Two

Specific Aim Two: To evaluate whether depression, fatigue, declines in cognitive function and uncertainty, enabling skills (self-control in this study) and self-management (coping in this study) influence quality of life outcomes in women with multiple sclerosis.

Quality of Life (QOL) was previously defined in this study as overall enjoyment of life and one's sense of well-being and how their ability to perform various activities contributes to quality of life. Essentially, the higher the PCS or MCS score, the greater the respondent overall QOL.

In this study, respondents with greater uncertainty and higher maladaptive coping scores experienced lower physical health scores, lower mental health scores and poorer quality of life. This is consistent with the literature that reports uncertainty is associated with poorer quality of life (Braden, 1993; Funk, Tournquist, Champagne & Wiese, 1993; Sorenson, Janusek, & Matthews, 2006; Mishel & Braden, 1988). Higher depression scores, greater perceived declines in cognitive function and higher fatigue scores were associated with lower physical health scores, lower mental health scores and poorer quality of life. While these common symptoms have been evaluated individually with respect to quality of life, this study adds to the literature regarding how highly correlated these symptoms are with each other as well as their impact on overall quality of life. Additional findings indicated that respondents with greater enabling skills were associated with higher mental health.

The study findings indicated that depression, fatigue, declines in cognitive function and uncertainty, enabling skills and self-management can influence quality of life outcomes, both positively and negatively, in women with MS.

Findings Related to Learned Response Chronic Illness Self-Help Model

This research study described the relationships among common signs/symptoms (depression, fatigue, declines in cognitive function) in women with MS using a modified version of Braden's LRCISHM. Following is a discussion of the findings as they relate to each of the five stages of the model that were introduced in chapter I.

In Stage I of Braden's model, common symptoms of MS (depression, declines in cognitive function and fatigue) were included as disease characteristics. Correlation was used to measure the relationships among the variables. As predicted, the study findings indicated a strong positive correlation between depression and declines in cognitive function, depression and fatigue, and declines in cognitive function and fatigue. The hypothesis that the common symptoms would be significantly associated, which was not previously studied by other researchers using Braden's theoretical framework, was part of this modified version of Braden's hypotheses and was supported by the findings.

In Stage II, uncertainty was the adverse aspect. Participants with higher depression rates reported greater uncertainty. Participants with greater decline in cognitive function reported greater uncertainty. Participants with greater fatigue reported greater uncertainty. As predicted, Stage I disease characteristics had a direct correlation with Stage II's uncertainty. This is consistent with Braden's hypothesis (1993b) and consistent with both Owen's (2007) and LeFort's (2000) adaptations of Braden's work. The hypothesized model (figure 2) was supported by the findings.

In Stage III, the findings indicated that the variables within Stage I were not a strong predictor of Stage III's enabling skills (self-control). Furthermore, Stage II's uncertainty was not

a strong predictor of Stage III's enabling skills. In this study, Stages I and II did not predict Stage III. This is consistent with the makeup of the theoretical framework. Specifically, the role of the enabling skills (self-control in this study) is to mediate the effects of adversity (such as Stage II's uncertainty) on outcomes (LeFort, 2000).

In Stage IV of this study, self-management was defined as coping. As anticipated, Stage II's uncertainty was correlated with Stage IV's maladaptive coping. Participants with higher uncertainty reported higher maladaptive coping indicating that higher uncertainty leads to poorer coping. A moderately positive relationship was found between Stage III's enabling skills (self-control in this study) and Stage IV's adaptive coping, indicating participants with higher adaptive coping skills had greater self-control. This is consistent with Braden (1990) and LeFort (2000) as well as Chuang, Lin and Gau (2010) whose study found a positive correlation between enabling skills and self-management. However, the relationship between self-control and maladaptive coping (as hypothesized in Figure 2 and updated in Figure 5) was not as significant as anticipated, which may or may not be significant as Lazarus (2000) indicates use of both types of coping skills is necessary and helps with adaptation and outocmes. Finally, analysis of the two distinct types of coping skills contained within Stage IV, adaptive and maladaptive coping, indicated that a weak positive relationship exists between the two indicating participants use both adaptive and maladaptive coping methods. This is consistent with previous studies which found both adaptive and maladaptive coping skills being used by those with MS (Chalk, 2007; Lode et al., 2007).

In Stage V, the final stage, quality of life (QOL) was retained as QOL: Physical Health and QOL: Mental Health. There was a strong relationship between Stage I and Stage V.

Participants who reported higher depression, greater decline in cognitive function and greater fatigue had poorer mental health and poorer physical health. Correlation and regression analysis aimed at evaluating the relationship between Stage I and Stage V was part of this study using a modified version of Braden's LRCISHM (Figure 2). Previous studies had focused on how Stage I variables impacted Stage II's averse aspects and how that impacted QOL (Braden, 1993; LeFort, 2000). While Owen (2007) intended to look for a relationship between her Stage I side effect burden and Stage V's QOL, a relationship was not reported in her findings. This study was successful in showing a relationship between the variables of Stage I and QOL in Stage V (Figure 5). Additional research aimed at exploring the relationship between Stage I and Stage V could provide insight on how the disease characteristics may directly impact QOL in other chronic illness populations. Additional research aimed at further exploring the relationship between Stage I and Stage V variables in an MS population would also be beneficial.

There was a strong correlation between Stage II and Stage V. Participants who reported higher uncertainty reported poorer mental health and poorer physical health. This is consistent with the tenets of the theoretical framework; it was previously found that the averse aspects of Stage II would have a negative impact on Stage V (Braden, 1993b). A moderate relationship existed between Stage III's enabling skills (self-control) and Stage V. Braden (1990b; 1993b) felt that if sufficient enabling skills were present, illness severity, uncertainty and dependency wouldn't overwhelm the person and he/she would be able to maintain life satisfaction.

A negative relationship was identified between Stage IV's maladaptive coping and Stage V. Respondents with higher maladaptive coping suffer from lower mental health scores. A significant relationship was not found between Stage IV's adaptive coping and Stage V. This

differs from Montel and Bungener (2007) who observed both positive and negative coping strategies as predictors of QOL. The findings indicate overall QOL was lower in respondents who had higher depression, greater decline in cognitive function, greater fatigue, higher uncertainty, low self-control and higher maladaptive coping.

This research study described the relationships among common signs/symptoms (depression, fatigue, declines in cognitive function) in women with MS using a modified version of Braden's LRCISHM. While only a first study, the findings of this exploratory research study support the use of this model in women with MS.

Strengths of the Study

The strengths of this study include the design, the instruments and the population. First, this was a descriptive cross-sectional pilot study. First, this was a descriptive cross-sectional pilot study. The design chosen allowed for the study to be exploratory in nature. Second, the measurement tools utilized were strengths of the study. Each of the measurement tools used had been previously validated for use in an MS population or in a similar chronic illness population and possessed good psychometric properties. Finally, the inclusion criteria set forth was also a strength of the study. By setting participant parameters the researcher may have been able to control for some of the differences that would be seen, for example, in those with child-onset MS.

Limitations of the Study

There are several limitations to this study that should be considered. First, a relatively high proportion of the respondents missed one or more questions contained in the survey packet, in particular on the questionnaire used to assess quality of life (the SF-36). As a result, mental

and physical composite summary scores were only able to be calculated for 64% of the respondents (N= 68). Second, due to a data generation error, two questions were left off of the 21-point modified fatigue impact scale (MFIS-21) necessitating the use of the 5 point scale (MFIS-5). While the MFIS-5 is a valid instrument, it was not intended for the study. Had the surveys been formatted in a different manner, these events may not have occurred. The intended survey would have been analyzed and there would potentially have been more mental and physical composite summary scores. To prevent a similar experience in future studies, altering the format of the survey to facilitate respondent success is recommended.

A third limitation to this study is that it relied entirely on self-report measures. As a result, there are no objective measures included in the findings. Inclusion of an objective measure might have provided different insight into the research questions. Furthermore, many individuals wrote in their own comments about living with MS and in one instance, gratitude that someone was looking at the cognitive side of MS. Perhaps a qualitative method might yield interesting data and insights into coping with MS.

Another limitation to the research study is that the study only included women with MS who lived within the southwestern United States. Thus, the findings may not represent the general population of women with MS. Had the study been open to the contiguous United States and State information obtained within the demographic questionnaire, the findings might be considered more representative of the general population of women in the United States with MS.

Suggestions for Future Research

The results and the limitations of this study provide implications for future research. The findings of this initial research study indicate that use of Braden's LRCISHM is appropriate and viable in an MS population. However, as it is only a first study, additional studies involving this modified version of Braden's LRCISHM are recommended. While this study measured three common signs/symptoms (depression, fatigue, declines in cognitive function) seen in MS, it may be desirable in future studies to incorporate disability levels within Braden's model since research indicates MS is one of the most common causes of non-traumatic disability in young and middle-aged people in the United States (Cleveland Clinic, 2011).

Future studies should be expanded to include women with MS who live outside the southwestern United States. By including individuals within the contiguous United States, the findings from the data will have greater generalizability to women in the United States with MS. Finally, future research studies aimed at looking at men with MS should also be considered. While the American Academy of Neurology (2007) reports women are at least four times more likely than men to be diagnosed with MS, the Veterans Administration (2013) reports that there are approximately 35,000 military veterans with MS, which is roughly 9% of the 400,000 people in the United States currently living with MS.

Summary

In this final chapter, the study findings as they related to the primary research aims of this dissertation study and Braden's Learned Response Chronic Illness Self Help Model were presented. The strengths, limitations and the significance to nursing were discussed. Finally, recommendations for future research were also given.

APPENDIX A:

COVER LETTER

Dear NARCOMS Participant:

My name is Cheri Gray, BSN, RN. I am a doctoral student at The University of Arizona in the College of Nursing. I am inviting you to participate in a research project entitled: Depression, Fatigue, Declines in Cognitive Function and Uncertainty in Women with Multiple Sclerosis. You are one of approximately five hundred women who are being invited to participate.

The purpose of this study is to 1) describe the relationships among common symptoms of Multiple Sclerosis including depression, fatigue and changes in cognitive function and 2) evaluate whether these symptoms along with uncertainty influence quality of life outcomes in **women** with Multiple Sclerosis. This study has been approved by The University of Arizona's Institutional Review Board.

Your participation in this study is voluntary. You may refuse to participate in this study. If you decide to take part in the study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you and your decision will not affect your future relationship with The University of Arizona or The NARCOMS registry. To participate in this voluntary study, please answer all of the questions contained in the seven part survey included in this package. You will only be contacted this one time for the study. Should you agree to participate, your involvement in this study is complete after you have answered all of the questions in the seven part survey. Once completed, please mail the completed seven part survey in the enclosed addressed and postage-paid enveloped.

The questionnaires are anonymous and take approximately sixty to seventy-five minutes to complete. Please feel free to take breaks as needed. You will not receive compensation for participating in this research study. There are no identified risks from participating in this research; however, some participants may experience some fatigue associated with answering all of the questions. Again, I encourage you to take breaks as needed. There are no benefits to individuals participating in the study. Potential benefits to society may be educational in the form of new knowledge about relationships between specific symptoms commonly seen in Multiple Sclerosis including depression, fatigue and declines in cognitive function.

To protect your privacy, your personal information will not be collected. Additionally, I will not have access to any of your personal information as these packets are being mailed out by

NARCOMS and can be completed in the privacy of your own home or other location at your own discretion. Completed surveys that I receive in the mail will be entered into the computer for data analysis. Once the data is double checked by me for accuracy, the survey will be shredded.

In the event a participant accidentally provides me with his or her personal information, that information will be shredded immediately. If that information is contained on the completed questionnaire, it will be removed and shredded prior to inputting the data into the computer for analysis.

Completion of the enclosed survey and mailing it back in the enclosed addressed and postage paid envelope will constitute agreement to participate in this voluntary research study.

Thank you for your time and consideration. If you have any questions or concerns, please contact me at 520-400-6100. If you have questions about your rights as a participant in this study or to voice concerns with someone other than the investigator, you may contact the Human Subjects Protection Program at 520-626-6721 or online at http://orcr.arizona.edu/hspp. I greatly appreciate your assistance with this study!

Sincerely,

Cheri L. Gray, BSN, RN

APPENDIX B:

DEMOGRAPHIC AND ILLNESS CHARACTERISTICS

DEMOGRAPHIC AND ILLNESS CHARACTERISTICS

The first set of questions are about you. Please complete the answers to each question to the best of your ability.

What is your current age in years? _____

How old were you when you were diagnosed with Multiple Sclerosis? _____

What age did you have your first symptoms? _____

What did they tell you your disease type was at diagnosis? (Please check your type of disease)

__ Relapsing-Remitting
__ Primary-Progressive
__ Secondary-Progressive
__ Progressive-Relapsing

What current form of Multiple Sclerosis disease do you have? (Please check your disease type)

__ Relapsing-Remitting
__ Primary-Progressive
__ Secondary-Progressive
__ Progressive-Relapsing

Are you currently employed? (please check one)

__ Employed
__ Unemployed
__ Retired
__ Disabled

APPENDIX C:

PATIENT HEALTH QUESTIONNAIRE-9

PATIENT HEALTH QUESTIONNAIRE-9 (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems? *(Use "✔" to indicate your answer)*	**Not at all**	**Several days**	**More than half the days**	**Nearly every day**
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite- being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

FOR OFFICE CODING *0*_____+_____+_____+ _____

=Total Score: _____

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people? (*Please circle one)*

Not difficult at all	**Somewhat difficult**	**Very difficult**	**Extremely difficult**

APPENDIX D:

PERCEIVED DEFICITS QUESTIONNAIRE

PERCEIVED DEFICITS QUESTIONNAIRE (PDQ)

Everyone at some point experiences problems with memory, attention, or concentration, but these problems may occur more frequently for individuals with neurologic diseases like MS. The following questions describe several situations in which a person may encounter problems with memory, attention or concentration. If you are marking your own answers, please circle the appropriate response (0, 1, 2,...) based on your cognitive function during the past 4 weeks. If you need help in marking your responses, tell the interviewer the number of the best response. Please answer every question. If you are not sure which answer to select, please choose the one answer that comes closest to describing you. The interviewer can explain any words or phrases that you do not understand.

Responses:	**Never** **0**	**Rarely** **1**	**Sometimes** **2**	**Often** **3**	**Almost Always** **4**
During the past four weeks, how often did you …					
1. Lose your train of thought when speaking?	0	1	2	3	4
2. Have difficulty remembering the names of people, even ones you have met several times?	0	1	2	3	4
3. Forget what you came into the room for?	0	1	2	3	4
4. Have trouble getting things organized?	0	1	2	3	4
5. Have trouble concentrating on what people are saying during a conversation?	0	1	2	3	4
6. Forget if you had already done something?	0	1	2	3	4
7. Miss appointments and meetings you had scheduled?	0	1	2	3	4
8. Have difficulty planning what to do in the day?	0	1	2	3	4
9. Have trouble concentrating on things like watching a television program or reading a book?	0	1	2	3	4
10. Forget what you did the night before?	0	1	2	3	4
11. Forget the date unless you looked it up?	0	1	2	3	4
12. Have trouble getting started, even if you had a lot of things to do?	0	1	2	3	4
13. Find your mind drifting?	0	1	2	3	4
14. Forget what you talked about after a telephone conversation?	0	1	2	3	4
15. Forget to do things like turn off the stove or turn on your alarm clock?	0	1	2	3	4
16. Feel like your mind went totally blank?	0	1	2	3	4
17. Have trouble holding phone numbers in your head, even for a few seconds?	0	1	2	3	4
18. Forget what you did last weekend?	0	1	2	3	4
19. Forget to take your medication?	0	1	2	3	4
20. Have trouble making decisions?	0	1	2	3	4

APPENDIX E:

MODIFIED FATIGUE IMPACT SCALE

MODIFIED FATIGUE IMPACT SCALE (MFIS)

Following is a list of statements that describe how fatigue may affect a person. Fatigue is a feeling of physical tiredness and lack of energy that many people experience from time to time. In medical conditions like MS, feelings of fatigue can occur more often and have a greater impact than usual. Please read each statement carefully, and then circle the one number that best indicates how often fatigue has affected you in this way during the past 4 weeks. (If you need help in marking your responses, tell the interviewer the number of the best response.) Please answer every question. If you are not sure which answer to select, please choose the one answer that comes closest to describing you. The interviewer can explain any words or phrases that you do not understand.

Responses:	**Never 0**	**Rarely 1**	**Sometimes 2**	**Often 3**	**Almost Always 4**
Because of my fatigue during the past four weeks …					
1. I have been less alert.	0	1	2	3	4
2. I have had difficulty paying attention for long periods of time.	0	1	2	3	4
3. I have been unable to think clearly.	0	1	2	3	4
4. I have been clumsy and uncoordinated.	0	1	2	3	4
5. I have been forgetful.	0	1	2	3	4
6. I have had to pace myself in my physical activities.	0	1	2	3	4
7. I have been less motivated to do anything that requires physical effort.	0	1	2	3	4
8. I have been less motivated to participated in social activities.	0	1	2	3	4
9. I have been limited in my ability to do things away from home.	0	1	2	3	4
10. I have had trouble maintaining physical effort for long periods.	0	1	2	3	4
11. I have had difficulty making decisions.	0	1	2	3	4
12. I have been less motivated to do anything that requires thinking.	0	1	2	3	4
13. My muscles have felt weak.	0	1	2	3	4
14. I have been physically uncomfortable.	0	1	2	3	4
15. I have had trouble finishing tasks that require thinking.	0	1	2	3	4
16. I have had difficulty organizing my thoughts when doing things at home or at work.	0	1	2	3	4
17. I have been less able to complete tasks that require physical effort.	0	1	2	3	4
18. My thinking has been slowed down.	0	1	2	3	4
19. I have had trouble concentrating.	0	1	2	3	4
20. I have limited my physical activities.	0	1	2	3	4
21. I have needed to rest more often or for longer periods.	0	1	2	3	4

APPENDIX F:

MISHEL UNCERTAINTY IN ILLNESS SCALE- ADULT FORM

MISHEL UNCERTAINTY IN ILLNESS SCALE – ADULT FORM

INSTRUCTIONS:
Please read each statement. Take your time and think about what each statement says. Then place a "X" under the column that most closely measures how you are feeling TODAY. If you agree with a statement, then you would mark under either "Strongly Agree" or "Agree". If you disagree with a statement, then mark under either "Strongly Disagree" or "Disagree". If you are undecided about how you feel, then mark under "Undecided" for that statement. Please respond to every statement.

Responses:	**Strongly Agree 5**	**Agree 4**	**Undecided 3**	**Disagree 2**	**Strongly Disagree 1**
1. I don't know what is wrong with me.	5	4	3	2	1
2. I have a lot of questions without answers.	5	4	3	2	1
3. I am unsure if my illness is getting better or worse.	5	4	3	2	1
4. It is unclear how bad my pain will be.	5	4	3	2	1
5. The explanations they give about my condition seem hazy to me.	5	4	3	2	1
6. The purpose of each treatment is clear to me.	5	4	3	2	1
7. When I have pain, I know what this means about my condition.	5	4	3	2	1
8. I do not know when to expect things will be done to me.	5	4	3	2	1
9. My symptoms continue to change unpredictably.	5	4	3	2	1
10. I understand everything explained to me.	5	4	3	2	1
11. The doctors say things to me that could have many meanings.	5	4	3	2	1
12. I can predict how long my illness will last.	5	4	3	2	1
13. My treatment is too complex to figure out.	5	4	3	2	1
14. It is difficult to know if the treatments or medications I am getting are helping.	5	4	3	2	1
15. There are so many different types of staff; it's unclear who is responsible for what.	5	4	3	2	1
16. Because of the unpredictability of my illness, I cannot plan for the future.	5	4	3	2	1
17. The course of my illness keeps changing. I have good and bad days.	5	4	3	2	1
18. It's vague to me how I will manage my care after I leave the hospital.	5	4	3	2	1
19. I have been given many differing opinions about what is wrong with me.	5	4	3	2	1
20. It is not clear what is going to happen to me.	5	4	3	2	1
21. I usually know if I am going to have a good or bad day.	5	4	3	2	1
22. The results of my tests are inconsistent.	5	4	3	2	1
23. The effectiveness of the treatment is undetermined.	5	4	3	2	1
24. It is difficult to determine how long it will be before I can care for myself.	5	4	3	2	1
25. I can generally predict the course of my illness.	5	4	3	2	1

MISHEL UNCERTAINTY IN ILLNESS SCALE – ADULT FORM - *Continued*

Responses:	**Strongly Agree 5**	**Agree 4**	**Undecided 3**	**Disagree 2**	**Strongly Disagree 1**
26. Because of the treatment, what I can do and cannot do keeps changing.	5	4	3	2	1
27. I'm certain they will not find anything else wrong with me.	5	4	3	2	1
28. The treatment I am receiving has a known probability of success.	5	4	3	2	1
29. They have not given me a specific diagnosis.	5	4	3	2	1
30. My physical distress is predictable; I know when it is going to get better or worse.	5	4	3	2	1
31. I can depend on the nurses to be there when I need them.	5	4	3	2	1
32. The seriousness of my illness has been determined.	5	4	3	2	1
33. The doctors and nurses use everyday language so I can understand what they are saying.	5	4	3	2	1

APPENDIX G:

SELF-CONTROL SCALE QUESTIONNAIRE

Self-Control Scale Questionnaire

The next questions are about how you manage different things or situations since your illness. Read the following sentences and circle the number at the point on the line that best fits you ***today***.

1. When I do a boring job, I think about the less boring parts of the job and the reward I will receive once I am finished.

1 2 3 4 5 6 7 8 9 10
Not true about me — **True about me**

2. When I have to do something that makes me worry, I try to think how I can handle my worry.

1 2 3 4 5 6 7 8 9 10
Not true about me — **True about me**

3. Often by changing my way of thinking I am able to change my feelings about almost anything.

1 2 3 4 5 6 7 8 9 10
Not true about me — **True about me**

4. When I am feeling sad I try to think about pleasant things.

1 2 3 4 5 6 7 8 9 10
Not true about me — **True about me**

5. When I am faced with a difficult problem, I try to deal with it one step at a time.

1 2 3 4 5 6 7 8 9 10
Not true about me — **True about me**

6. When I have problems keeping my mind from wandering I look for ways to keep my mind on track.

1 2 3 4 5 6 7 8 9 10
Not true about me — **True about me**

7. When I try to get rid of a bad habit, I first try to find out all things that make me keep doing the habit.

1 2 3 4 5 6 7 8 9 10
Not true about me — **True about me**

SCS Questionnaire – *Continued*

8. When a bad thought is bothering me, I try to think about something good.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

9. When I am in a low mood, I try to act cheerful so my mood will change.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

10. When I am in a low mood, I try to keep myself busy with things that I like.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

11. When I find it hard to settle down and do a certain job, I look for ways to help me settle down.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

12. I feel better about myself when I am able to overcome a bad habit.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

13. If I fail at something, I often tell myself that it is not so bad and that I can do something about it.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

14. When I act before I think, I tell myself to stop and think before I do anything.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

15. Even when I am very angry at somebody, I think about my actions very carefully.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

SCS Questionnaire – *Continued*

16. When I have to make a decision, I try to find all the possible choices instead of deciding quickly without thought.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

17. When I realize that I will be late for something important, I tell myself to keep calm.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

18. When I have a lot of things to do, I try to plan my work more carefully.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

19. When I am short of money, I try to plan more carefully in the future.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

20. If I find it hard to think on a certain job, I do one part of the job at a time.

1	2	3	4	5	6	7	8	9	10
Not true about me									**True about me**

APPENDIX H:

BRIEF COPE

Brief COPE

These items deal with ways you've been coping with the stress in your life since your MS diagnosis. There are many ways to try to deal with problems. These items ask what you've been doing to cope with this one. Obviously, different people deal with things in different ways, but I'm interested in how you've tried to deal with it during the last four weeks. Each item says something about a particular way of coping. I want to know to what extent you've been doing what the item says. How much or how frequently. Don't answer on the basis of whether it seems to be working or not—just whether or not you're doing it. Use these response choices. Try to rate each item separately in your mind from the others. Make your answers as true FOR YOU as you can.

Responses:	**I haven't been doing this at all 1**	**I have been doing this a little bit 2**	**I have been doing this a medium amount 3**	**I have been doing this a lot 4**
During the past four weeks …				
1. I've been turning to work or other activities to take my mind off things.	1	2	3	4
2. I've been concentrating my efforts on doing something about the situation I'm in.	1	2	3	4
3. I've been saying to myself "this isn't real."	1	2	3	4
4. I've been using alcohol or other drugs to make myself feel better.	1	2	3	4
5. I've been getting emotional support from others.	1	2	3	4
6. I've been giving up trying to deal with it.	1	2	3	4
7. I've been taking action to try to make the situation better.	1	2	3	4
8. I've been refusing to believe that it has happened.	1	2	3	4
9. I've been saying things to let my unpleasant feelings escape.	1	2	3	4
10. I've been getting help and advice from other people.	1	2	3	4
11. I've been using alcohol or other drugs to help me get through it.	1	2	3	4
12. I've been trying to see it in a different light, to make it seem more positive.	1	2	3	4
13. I've been criticizing myself.	1	2	3	4
14. I've been trying to come up with a strategy about what to do.	1	2	3	4
15. I've been getting comfort and understanding from someone.	1	2	3	4
16. I've been giving up the attempt to cope.	1	2	3	4
17. I've been looking for something good in what is happening.	1	2	3	4
18. I've been making jokes about it.	1	2	3	4
19. I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.	1	2	3	4
20. I've been accepting the reality of the fact that it has happened.	1	2	3	4
21. I've been expressing my negative feelings.	1	2	3	4

Brief COPE - *Continued*

22. I've been trying to find comfort in my religion or spiritual beliefs.	1	2	3	4
23. I've been trying to get advice or help from other people about what to do.	1	2	3	4
24. I've been learning to live with it.	1	2	3	4
25. I've been thinking hard about what steps to take.	1	2	3	4
26. I've been blaming myself for things that happened.	1	2	3	4
27. I've been praying or meditating.	1	2	3	4
28. I've been making fun of the situation.	1	2	3	4

APPENDIX I:

SF-36 HEALTH STATUS QUESTIONNAIRE

SF-36 HEALTH STATUS QUESTIONNAIRE (SF-36)

This survey asks for your views about your health and daily activities. If you are marking your own answers, please circle the appropriate responses (0, 1, 2,...). If you need help in marking your responses, tell the interviewer the number of the best response (or what to fill in). Please answer every question. If you are not sure which answer to select, please choose the one answer that comes closest to describing you. The interviewer can explain any words or phrases that you do not understand.

1. In general, would you say your health is:

Excellent	Very Good	Good	Fair	Poor
1	2	3	4	5

2. For each statement please circle the one number that indicates how 'true' or 'false' that statement is for you.

	Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
a) I seem to get sick a little easier than other people.	1	2	3	4	5
b) I am as healthy as anybody I know.	1	2	3	4	5
c) I expect my health to get worse.	1	2	3	4	5
d) My health is excellent.	1	2	3	4	5

3. Compared to one year ago, how would you rate your health in general now?

Much Better	Somewhat Better	Somewhat Same	Much Worse	Worse
1	2	3	4	5

4. Now, think about the activities you might do on a typical day. Does your health limit you in these activities? If so, how much?

Please circle 1, 2 or 3 for each item to indicate how much your health limits you.

	Yes, Limited A Lot	Yes, Limited A Little	No, Not Limited At All
a) Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
b) Moderate activities, such as moving a table, pushing a vacuum cleaner or bowling, or playing golf	1	2	3
c) Lifting or carrying groceries	1	2	3
d) Climbing several flights of stairs	1	2	3
e) Climbing one flight of stairs	1	2	3
f) Bending, kneeling, or stooping	1	2	3
g) Walking more than a mile	1	2	3
h) Walking several blocks	1	2	3
i) Walking one block	1	2	3
j) Bathing and dressing yourself	1	2	3

SF-36 *Continued* 2

5. 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?

Please circle "1" (Yes) or "2" (No) for each item.

	YES	NO
a) Cut down on the amount of time you spent on work or other activities	1	2
b) Accomplished less than you would like	1	2
c) Were limited in the kind of work or other activities	1	2
d) Had difficulty performing the work or other activities (e.g., it took extra effort)	1	2

6. How much bodily pain have you had during the past 4 weeks?

None	Very Mild	Mild	Moderate	Severe	Very Severe
1	2	3	4	5	6

7. During the past 4 weeks, how much did pain interfere with your normal work (including work both outside the home and housework)?

Not At All	A Little Bit	Moderately	Quite A Bit	Extremely
1	2	3	4	5

8. During the past 4 weeks, have you had the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)? Please circle "1" (Yes) or "2" (No) for each item.

	YES	NO
a) Cut down on the amount of time you spent on work or other activities	1	2
b) Accomplished less than you would like	1	2
c) Did do work or other activities less carefully than usual	1	2

9. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

Not At All	Slightly	Moderately	Quite A Bit	Extremely
1	2	3	4	5

SF-36 *Continued* 3

10. The next set of questions is about how you feel and how things have been with you during the past 4 weeks. For each question, please circle the one number for the answer that comes closest to the way you have been feeling.

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
a) Did you feel full of pep?	1	2	3	4	5	6
b) Have you been a very nervous person?	1	2	3	4	5	6
c) Have you felt so down in the dumps nothing could cheer you up?	1	2	3	4	5	6
d) Have you felt calm and peaceful?	1	2	3	4	5	6
e) Did you have a lot of energy?	1	2	3	4	5	6
f) Have you felt down hearted and blue?	1	2	3	4	5	6
g) Did you feel worn out?	1	2	3	4	5	6
h) Have you been a happy person?	1	2	3	4	5	6
i) Did you feel tired?	1	2	3	4	5	6

11. Finally, during the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

All of the time	Most of the time	Some of the time	A little of the time	None of the time
1	2	3	4	5

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