Fibromyalgia Pain and Physical Function: The Influence of Resilience

by

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ABSTRACT

Objectives: The purpose of this study was to explore factors associated with increased risk of disability in older adults living with fibromyalgia (FM) along with factors that protect or enhance physical function and promote health in the presence of FM. The study addressed the following specific aims:

1. Explore levels and correlates of pain, self-reported physical function and resilience in community-dwelling older adults living with FM. Descriptive aims had no hypothesis.
2. Examine theorized demographic and health-related predictors of self-reported physical function in community dwelling older adults living with FM. It was hypothesized that age, education, income, tangible social support, comorbidity, depressive symptoms, BMI, and physical activity predicted self-reported physical function.
3. Examine resilience as a moderator of the relationship between pain and self-reported physical function in community-dwelling older adults living with FM. It was hypothesized that high levels of resilience moderated (weakened) the relationship between pain level and physical function when controlling for significant predictors of self-reported physical function.

Methods: A descriptive correlational, cross-sectional design was used to explore and analyze relationships between demographic variables (age, education, income, tangible social support) and health-related measures (comorbidity, depressive symptoms, BMI, physical activity, FM impact, pain, resilience, and self-reported physical function) in a convenience sample of community-dwelling older adults diagnosed with FM (N = 224, M_{age} = 62.1 yrs, SD = 6.75**).** Data was collected via one-time mailed questionnaire.

Results: Participants in this convenience sample were predominantly female, Caucasian, married, well-educated, had moderate levels of tangible social support. Nearly three-fourths (74%) reported household incomes >$20,000/year. Three fourths of the sample was classified as overweight or obese and the average level of physical activity was low. Over three fourths of the participants reported pain as moderate or severe and, on average, reported moderate limitations in physical function. Despite impaired physical function and moderate to severe levels of pain, the level of resilience was moderately high in this sample. Advanced age, low levels of depressive symptoms, low pain ratings, high levels of physical function, and low overall FM impact were significant and clinically important correlates of high levels of resilience. Significant and clinically important correlates of pain included physical function, depressive symptoms, and overall FM impact. Almost one third of the variance in physical function scores (30%) was accounted for by six of the eight theorized predictors; however, tangible social support and comorbidity did not uniquely contribute to the variance in physical function. Pain and resilience accounted for an additional 15% and 3%, respectively, to account for a total of 48% of the variation in physical function scores. The level of resilience did not moderate the relationship between pain and physical function as hypothesized; resilience contributed uniquely to the variance in physical function.

Conclusions: Older adults with FM had moderately high levels of resilience despite moderate to severe levels of pain and impaired physical function. Resilience may help to explain why some older adults with FM report less impact than do younger persons with

FM. Resilience did not moderate the impact of pain on physical function; resilience and pain were both independent predictors of physical function in older adults with FM. Older adults with FM who are at most risk for poor physical function are those with limited resilience and high pain. The results of this study will hopefully inspire further research of interventions designed to reduce the risk of disability and promote health and quality of life in a growing number of older adults living with persistent and painful conditions like FM.

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Statement of the Problem

The percentage of persons over 65 years of age is expected to grow to an unprecedented 19.6% of the U.S. population by 2030 (Centers for Disease Control and Prevention, 2003). Unfortunately, this growing segment of the population is also at high risk for painful conditions that can negatively impact a person's physical function, making it difficult to participate in meaningful activity (Centers for Disease Control and Prevention, 2003; Feletar, Hall, Breuer, & Williams, 2002; Gallagher, 2003; Helme & Gibson, 2001; Weiner, Herr, & Rudy, 2002). Pain in older adults is a major concern because prevalence is high (~50%) and its impact on physical function increases with age, especially if the pain is persistent (> 3 months) (Helme & Gibson, 2001; Scudds & Robertson, 2000; Thomas, Mottram, Peat, Wilkie, & Croft, 2006). Acute pain serves an important function—to raise awareness of injury and need to seek treatment—and usually resolves with healing. Chronic, persistent pain, however, does not protect or resolve. Rather its presence impairs physiological, sociological, and psychological function and is associated with the development of other health problems (e.g., fatigue, sleep disturbance, depression, anxiety and cognitive impairment) that can also negatively affect physical function (Gureje, Von Korff, Simon, & Gater, 1998).

Along with duration, the location and intensity of pain also play an important role in the development of disability (Leveille, Bean, Ngo, McMullen, & Guralnik, 2007; Lichtenstein, Dhanda, Cornell, Escalante, & Hazuda, 1998; Scudds & Robertson, 1998; Scudds & Robertson, 2000). Functional problems increase with the number and severity of pain sites (Kamaleri, Natvig, Ihlebaek, & Bruusgaard, 2008) and the presence of widespread pain predicts worsening difficulty in persons with pre-existing functional limitations (Leveille et al., 2001). Widespread pain associated with FM is of particular concern in older adults. FM is a persistent, widespread pain condition that is also characterized by tenderness, fatigue, depression, and sleep disturbance. It often begins in the third or fourth decade of life and is as disabling, or more, than osteoarthritis and rheumatoid arthritis (Jones, Rutledge, Jones, Matallana, & Rooks, 2008; Wolfe, Ross, Anderson, Russell, & Hebert, 1995). In a recent national survey of women living with FM (N = 1,735), researchers compared levels of physical function in this group with community-residing women 60 to 89 years of age without FM (N = 4,886) (Jones et al., 2008). They found that the women with FM (mean age, 47) reported significantly lower levels of physical function than the average 80 to 90 year-old woman living in the community. Research is needed to explore strategies that can moderate the impact of FM pain on physical function to reduce the risk of disability in a growing number of older adults.

It is important to note that there is considerable variation in the strength of the relationship between FM pain and impact on physical function—there are those who continue to function despite the presence of pain (Turk & Sherman, 2002). Despite longer duration of disease, older adults in general tend to report less impact from FM than do middle-aged persons (Burckhardt, Clark, & Bennett, 2001; Cronan, Serber, Walen, & Jaffe, 2002; Shillam, 2008). Pain is a biopsychosocial experience and psychological qualities that moderate stress and promote adaptation may explain the reported variation in response and impact of FM pain on physical function (Turk & Monarch, 2002)

Much of the research exploring the influence of psychological factors on the relationship between FM pain and physical function in older adults has focused on pathology—exploring negative risk factors that contribute to the development of disability like depression, anxiety, negative affect, and fear. Much less is known about the influence of positive psychological factors that could not only moderate the risk of disability but also promote or protect physical function in the presence of FM. It is important to study not only risk factors that contribute to negative outcomes like disability, but also protective factors that contribute to positive outcomes like the ability to participate in life activities. There is much to be learned from those who continue to function despite illness and pain.

Resilience, the protective and adaptive capacity to recover from adversity, is an innate process that involves dynamic interaction of protective internal, external, environmental, developmental, and longitudinal factors (Dyer & McGuinness, 1996; Polk, 1997). Resilience is associated with positive affective states like self-efficacy, extroversion, and optimism, and has been identified as protective of psychological function in older adults experiencing stress (Kempen, Ranchor, van Sonderen, van Jaarsveld, & Sanderman, 2006; Montross et al., 2006; Talsma, 1995; Wagnild & Young, 1990). Although very little is known about its influence on the relationship between FM pain and physical function, a recent study of adults (N = 275) with osteoarthritis (OA) found that measures of risk (neuroticism, depression, negative affect) and resilience (extraversion, vitality, positive affect) were both independent predictors of pain and physical function (Wright, Zautra, Going, 2008). Resilience indirectly protected physical function through self-efficacy, supporting the researchers' assertion that it is important to simultaneously reduce risk and enhance resilience to minimize the potential impact of arthritis pain on physical function. It is possible that resilience may have the same relationship with FM pain and physical function. Research exploring resilience and its potential to moderate the negative impact of FM pain on an older adult's ability to function is needed.

Significance to Nursing

Pain is one of the most frequently identified symptoms of disease and often the primary motivation for seeking health care (Andersen, Crespo, Ling, Bathon, & Bartlett, 1999; Blyth, March, Brnabic, & Cousins, 2004; Centers for Disease Control and Prevention, 2003; Gallagher, 2000; Helme & Gibson, 2001; Herr & Mobily, 1992; Marple, Kroenke, Lucey, Wilder, & Lucas, 1997; Ross & Crook, 1998; Schappert, 1992; Scudds & Robertson, 2000; Weiner et al., 2003). The impact of FM pain on an older adult's physical function is of significant concern to nurses whose professional responsibility is to simultaneously promote health, prevent illness and injury, alleviate suffering, and advocate for care of the individuals, families, communities and populations (American Nurses Association, 2003, p. 6). The negative impact of FM pain on an older adult's ability to move purposely and participate in life activities significantly increases that person's utilization of health care resources and risk for institutionalization (A. G. S. Panel on Persistent Pain in Older Persons, 2002; Robinson et al., 2003; White, Speechley, Harth, & Ostbye, 1999b; Wolfe, 1990). The functional consequences of pain affect not only the older person and the formal care system, but also the older adult's families and friends—the informal care system—who provide most of the long term care to older adults living in the community (Schirm, 1990; Schulz & Quittner, 1998).

More importantly, physical function is closely associated with the experience of health in older adults. Aging is a dynamic process, often accompanied by significant adversity due to the cumulative and synergistic effects of lifestyle behaviors, disease, genetics, and age-related changes (Miller, 2008). The biomedical definition of health as absence of disease inadequately describes the experience of health in persons 65 years of age and older—nearly 90% of Medicare beneficiaries have at least one chronic condition (Hoffman, Rice, & Sung, 1996), and 60% have 2 or more (Wolff, Starfield, & Anderson, 2002). A person's subjective assessment of his/her ability to function psychologically and physically despite this adversity is a much more accurate measure of health in this population (Bryant, Beck, & Fairclough, 2000; Bryant, Corbett, & Kutner, 2001; Wilson & Cleary, 1995).

The experience of health in the midst of these challenges is best explained by Antonovsky's theory of salutogenesis (1987). In this theory, health is defined as a dynamic and constant presence in a person's life, and the perception of health is influenced by movement on a continuum anchored by health "ease" and "dis-ease". Health is enhanced when salutary (health-promoting) factors promote movement toward the 'ease' end of the health continuum, making it easier for a person to engage in meaningful activity. Pathogenic factors that promote movement toward the other end of the continuum (dis-ease) negatively affect health and the ability to engage in meaningful activity. Stressors are always present in the environment and have the potential to enhance, neutralize, or diminish the experience of health. A person's sense of coherence—the degree to which a person believes that the stress one is experiencing is comprehensible, manageable, and worth addressing (meaningful)—significantly influences movement on this health continuum. Using this framework, it is easy to see how health, often defined by older adults as the ability to function, can be experienced in the midst of illness. Movement toward the ‘dis-ease’ end of the continuum due to stressors associated with illness, could be slowed or reversed by protective factors that interact with these stressors to promote movement away from “dis-ease” and towards “ease”. For example, pain, a negative stressor often associated with illness, can influence movement toward the “dis-ease” end of the health continuum. Resilience, a personality characteristic that describes a person’s ability to ‘bounce back’ and adapt to stress, can interact with the negative stressor and moderate its negative effect on the person’s perception of health. If levels of resilience are high, the cumulative effect of the interaction between pain and resilience slows movement towards ‘dis-ease” (dis-ability) and encourages movement toward the “ease” end of the continuum (ability). In this way, the movement towards “ease” enhances a person’s experience of health despite the presence of pain.

It is important for nurses to identify not only factors associated with increased risk of disability but also those that protect or enhance physical function and promote health. This research is designed to inform the development of programming that will not only reduce the risk of disability but also promote health and quality of life for a growing number of older adults living with persistent and painful conditions like FM.

Specific Aims and Hypotheses

The purpose of this study is twofold: to explore the relationships between pain, physical function, and resilience in community-dwelling older adults living with FM and examine the influence of resilience on the relationship between FM pain and self-reported physical function.

The study will address the following specific aims:

1. Explore levels and correlates of FM pain, self-reported physical function and resilience in community-dwelling older adults living with FM. Descriptive aims have no hypothesis.

2. Examine theorized demographic and health-related predictors of self-reported physical function in community dwelling older adults living with FM. It is hypothesized that age, education, income, tangible social support, comorbidity, depressive symptoms BMI, and physical activity, predict self-reported physical function.

3. Examine resilience as a moderator of the relationship between FM pain and self-reported physical function in community-dwelling older adults living with FM. It is hypothesized that high levels of resilience moderate (weaken) the relationship between pain level and physical function when controlling for significant predictors of self-reported physical function,

Chapter Two: Review of Literature

The purpose of this chapter is to provide a succinct review of the most critical research supporting the rationale and conceptual model developed to guide the proposed study. The chapter begins with a review of the literature exploring each of the key concepts (pain, FM, physical function, and resilience) and what is currently known about each in community-dwelling older adults. This is followed by a review of the literature exploring resilience as a potential moderator of the relationship between FM pain and self-reported physical function. A brief summary of key findings and gaps identified in the literature review is provided at the conclusion of this section of the review. The proposed study's conceptual model, assumptions, and definition of terms are described in the final section.

Pain

Definition of Pain. Pain is a biopsychosocial phenomenon that is highly prevalent in older adults and can significantly impact physical function (A. G. S. Panel on Persistent Pain in Older Persons, 2002; Duong, Kerns, Towle, & Reid, 2005; Hadjistavropoulos et al., 2007; Scudds & Ostbye, 2001). In the proposed study, pain is defined as a multidimensional biopsychosocial construct, "an unpleasant, subjective sensory and emotional experience associated with actual or potential tissue damage" and has physical, emotional, cognitive and behavioral components (IASP Subcommittee on Taxonomy, 1979, p. 250; Snow et al., 2004). Pain is a perception arising from sensory input along with motivational and cognitive processing of nociceptive stimuli that can be modulated by interactions among central nervous system control processes in the brain (Melzack & Wall, 1965; Turk & Okifuji, 2002). For example, there is a growing body of evidence that cognitive and dispositional factors such as fear, catastrophizing, self-efficacy and locus of control can influence the pain experience (Turk, 2002). Cognitive strategies such as imagery, relaxation, or cognitive restructuring can also be used to modulate the perception of pain (Arnstein, 2002). Behaviors resulting from the perception of pain are governed by the complex interaction of the central control processes with an individual's motivational and sensory systems as well (Arnstein, 2002; Turk & Monarch, 2002).

Neuromatrix theory of pain. The neuromatrix theory of pain is the most recent attempt to explain how biological, psychological, and sociocultural dimensions of a person interact to influence pain perception and behaviors (Melzack, 2001). The term 'neuromatrix' describes a wide network of neural pathways that link thalamus, cortex, and limbic system of the brain where pain transmission, perception, and modulation are believed to occur (Melzack, 1999, 2001). Anything that affects the transmission, processing, or modulation pathways (the neuromatrix) can influence the perception of pain and/or behaviors (Bradley & McKendree-Smith, 2002; Melzack, 1999). Repeated processing of nerve impulses through the neuromatrix creates the development of a "neurosignature," a characteristic pattern that influences all nerve impulses that flow through the neuromatrix (Melzack, 1999, p S123). The neurosignature projects the patterned impulses into the "sentient neural hub" where they are converted into a steady stream of awareness or activate networks associated with movement.

There are other important factors that can influence the neurosignature besides genetics and sensory input. Additional input from cognitive and/or physical stressors can trigger endocrine, immune, and autonomic system activity that can have a significant effect on the neurosignature (Melzack, 1999). Cortisol is released during the stress response to ensure adequate levels of glucose needed for a rapid response to the stressor but prolonged stress and sustained levels of cortisol can accelerate muscle weakness, bone loss, along with neural damage. It is possible that the negative effects of a prolonged stress response can also negatively affect the neurosignature patterns and contribute to the development of chronic pain.

The neuromatrix theory of pain provides a comprehensive biopsychosocial framework that can be used to examine the experience of FM pain in older adults. It also supports the exploration of psychological factors like resilience that have the potential to moderate stress associated with pain and promote adaptation in older persons living with FM pain.

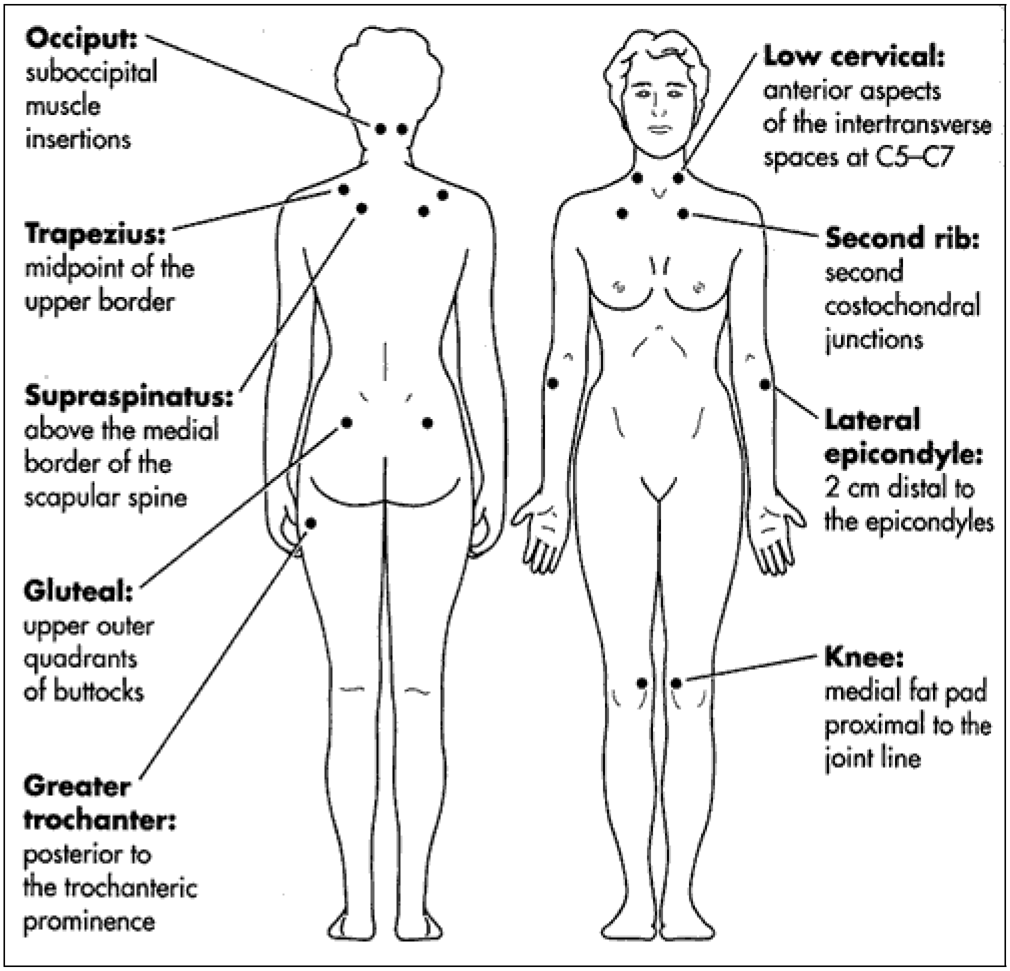
Dimensions of pain. A person's self-report of pain is the most reliable indicator of pain, and descriptions of physiologic, temporal, spatial, and sensory dimensions are used to characterize the multidimensional aspects of the pain perception (Hadjistavropoulos et al., 2007; McCaffrey & Pasero, 1999). The most commonly assessed dimensions in older adults include intensity, quality, location, distress, and temporal patterns (Ferrell & Coyle, 2001, p.57). Pain intensity is an important dimension that is frequently monitored as a vital sign in health care settings, and identified by the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) as a key domain of pain assessment in clinical trials (Dworkin et al., 2005; Mayer, Torma, Byock, & Norris, 2001). The quality of pain differs from intensity and describes the sensory and affective components of the pain experience and can be helpful in diagnosing the type of pain (e.g., neuropathic vs. nociceptive) (Jensen, 2006).

Location of pain is not assessed as frequently as the other dimensions, but recent research indicates that it is an important dimension to include in the assessment, especially when exploring the impact of pain on physical function (Lichtenstein et al., 1998). Single pain sites are actually relatively rare in the general population and don't impact function significantly, whereas pain severity and functional problems increase with the number of pain sites (Kamaleri et al., 2008; Leveille et al., 1998). Widespread pain in particular is an important predictor of disability (Leveille et al., 2001). Temporal patterns of pain include frequency, variability, and duration. Chronic pain is significantly associated with self-rated health (Mantyselka, Turunen, Ahonen, & Kumpusalo, 2003) and greater frequency is also associated with declines in physical function (Lichtenstein et al., 1998; Scudds & Robertson, 2000; Zhu, Devine, Dick, & Prince, 2007).

Fibromyalgia

Epidemiology. FM is a clinical syndrome characterized by widespread pain for at least three months and tenderness in at least eleven of eighteen specific points identified in a physical exam (Wolfe et al., 1990). Widespread pain is defined as pain on the left side of the body, pain on the right side of the body, pain above the waist, and pain below the waist in combination with axial pain (cervical spine or anterior chest or thoracic spine or low back) (Wolfe et al., 1990). Tender point criteria are met if a patient reports pain when ~4kg of pressure is applied to at least eleven of eighteen specified points on the body during a physical examination. The nine paired tender point locations are displayed in Figure 1.

Figure 1. FM Tender Points



These classification criteria, established by the American College of Rheumatology committee in 1990, describe the hallmark features of FM that are required for diagnosis, but FM is also often associated with additional health complaints including fatigue, sleep disturbance, headache, irritable bowel syndrome, mood disorders, morning stiffness, and cognitive difficulties (Abeles, Pillinger, Solitar, & Abeles, 2007; Katz, Wolfe, & Michaud, 2006; Mease et al., 2007). There is concern that limiting the diagnostic criteria to widespread pain and tender points not only neglects other important aspects of FM but also misrepresents the extent of disease in the population because the tender point criteria are associated with more severe cases of FM (Clauw & Crofford, 2003; Crofford &

Clauw, 2002; Mease, 2005). Assessment and diagnosis of FM is challenging because FM frequently co-exists with other rheumatic diseases like rheumatoid arthritis, lupus, and Sjogren's syndrome, and many of the FM symptoms are also associated with other diseases (Mease et al., 2005).

In 1995, the prevalence of FM in the US was reported to be 2% in the general population but prevalence was much higher in women (3.4%) than in men (0.05%). The prevalence of FM in (Wolfe et al., 1995) women increased to 5.6 % in the fifth decade and reached the highest point (7.4%) in those who were 70 to 79 years of age. These gender and age disparities were also observed by Wier and colleagues (2006) who examined an insurance database to determine the incidence rates of FM between 1998 and 2002 in persons up to 64 years of age. They found that women had over one and a half time the risk of incidence than men (1.64, CI = 1.59-1.69). The risk also increased with age—men and women 50 to 64 years of age had the highest incidence rates of FM. It is not known if this trend in incidence continued with advanced age because persons 65 years and older were excluded from the study. Most persons 65 years and older are covered by Medicare and this age group was not well represented in the insurance database.

Researchers have also reported higher prevalence of FM within families of a person who has FM, which suggests the possibility of genetic predisposition to FM. Arnold et al. (2004) reported that relatives of a proband with FM had 8.5 times the risk of developing FM than did relatives of a proband with rheumatoid arthritis (RA). The relatives of the FM patient also had more tender points than the relatives of the RA patient.

FM is associated with a substantial health burden. A recent review of worldwide studies that evaluated health status in persons with FM revealed that the health status burden of persons with FM was greater than the burden experienced with other impairing conditions (Hoffman & Dukes, 2008). Impairments in the eight domains measured by the SF-36 and SF-12 (physical functioning, bodily pain, general health, vitality, social functioning, role functioning difficulties due to emotional problems, and mental health) were all significantly higher in the FM groups than those in the general population. For example, mental health summary scores for FM groups were one standard deviation below the general population mean; physical health summary scores were two standard deviations below the mean for the general population. Among pain groups, FM groups also scored lower in the areas of bodily pain and vitality, two areas that are highly impacted by FM.

Persons with FM have a much higher likelihood of also having a comorbid major depressive disorder ($OR = 3.6$ (1.1 — 11), $p = 0.031$), panic disorder (9.0 (3.5 — 23), $p < 0.001$), obsessive compulsive disorder (4.8 (1.0 — 23), $p = 0.035$) than persons without FM (Arnold et al., 2006). The high incidence of psychiatric comorbidity is consistent with the theory that pain mechanisms share the same pathways as psychological mechanisms (Bair, Robinson, Katon, & Kroenke, 2003). For example, depression is associated with diminished neurotransmitters that are believed to inhibit pain—serotonin, norepinephrine and dopamine—and depression occurs in 25% to 60% of persons with FM (Coaccioli et al., 2008). The familial patterns of FM mentioned earlier have also been reported with major depressive disorder, which supports this assertion regarding shared mechanisms of disease (Ablin, Cohen, & Buskila, 2006).

The impact of FM on physical function is particularly disturbing. An internet survey of women diagnosed with FM (*N* = 1735) found that the average Activities of Daily Living/Instrumental Activities of Daily Living (ADL/IADL) functional levels in this group (mean age = 47 years) were lower than levels reported in community dwelling women over 80 years of age (Jones et al., 2008). Over 25% reported difficulty with personal care and bathing, > 60% had difficulty with light household tasks, and > 90% had difficulty with strenuous activities. An epidemiological study of noninstitutionalized Canadian adults diagnosed with FM found that nearly one third (31%) reported disability, compared to 10% of persons with pain, and only 2% of the control group (White et al., 1999b). Disabled persons with FM reported that pain, fatigue, and weakness had the most impact on their ability to work, and symptoms were more severe in the disabled group. It is interesting to note that they also observed a decline in disability rates after age 64, but no changes in other assessment data (number of symptoms, Functional Impact Questionnaire (FIQ) score or severity of pain or fatigue). Further study of this observed change in the relationship between FM pain and its impact on physical function in older adults is needed.

The significant health burden of FM leads to higher rates of health care utilization in this population. FM is one of the most common conditions treated in rheumatology, accounting for 10% to 20% of all visits while the number of FM patients range from 5% to 6% in general practice clinics (Mease, 2005). Analysis of health care costs in younger populations revealed that the average yearly cost for employees with FM in a two-year period was $5945, compared to $2486 for the typical employee (Robinson et al., 2003). The higher cost reflects an average of 6.3 visits per year for FM employees, compared to

2.3 for all employees. Not surprisingly, costs of care increase as the number of comorbidities, incidence of disability, and global disease severity increase (Robinson et al., 2003; Wolfe et al., 1997).

Treatment of FM is multidisciplinary and usually includes a combination of modalities. These modalities include medications to treat the symptoms, moderate exercise designed to prevent de-conditioning but not aggravate pain, pacing of activity to conserve energy, and cognitive behavioral therapy to enhance positive copings strategies (Longley, 2006; Turk & Sherman, 2002).

The multidimensional nature of FM makes it difficult to assess impact and evaluate outcomes of treatment (Mease et al., 2007; Mease et al., 2008). In an effort to reach consensus on the key domains of FM that should be assessed in research, clinicians used a Delphi exercise to identify key domains that were prioritized by those attending the 2004 Outcome Measures in Rheumatology Clinical Trials (OMERACT VII) FM workshop. This group identified pain as the most important domain to be assessed in FM, as did patients diagnosed with FM who participated in a similar Delphi exercise (Mease, 2005; Mease et al., 2008). The two groups also agreed that fatigue, impact on sleep, health-related quality of life, depression, cognitive difficulty, and function were additional important domains to assess in FM. Both groups further identified the importance of using multidimensional measures of function that assess the impact of FM on a person's physical function and ability to participate in life activities.

The functional impact of FM on the patient and society are significant. Research exploring the factors that reduce risk and protect physical function in older adults is needed to inform the development of strategies that can reduce the incidence of disability in an aging FM population.

Pathophysiology of FM. Despite the development of diagnostic criteria and increased interest in researching FM, there is no clear agreement on the cause of FM. However, there is growing consensus that there may be several mechanisms contributing to abnormal pain processing associated with FM. In a recent review of FM research, Abeles et al. (2007) concluded that aberrant central pain mechanisms including central sensitization, abnormalities of descending inhibitory pain pathways, neurotransmitter abnormalities and neurohumoral abnormalities were salient contributors. Psychiatric co-morbidity also has been implicated as contributing to the pathophysiology of FM in a subset of patients (Arnold et al., 2006).

Central sensitization describes enhanced transmission of nociceptive sensory input from the spinal cord to the brain. It is associated with functional changes in the central nervous system (neuroplasticity) that can heighten pain sensitivity: increased excitability and an enlarged receptive field of spinal cord neurons following injury, a reduction in pain threshold, and development of new afferent inputs (Abeles et al., 2007; Staud & Rodriguez, 2006). It is believed that central sensitization occurs at the level of the spine where n-methyl-d-aspartic acid (NMDA) receptors are located and activated by repeated neuronal depolarization (Abeles et al., 2007). Increased levels of excitatory neurotransmitters that enhance transmission of nociceptive stimuli at this level (substance P and nerve growth factor) have also been documented in FM patients (Giovengo, Russell, & Larson, 1999; Mease, 2005; Russell et al., 1994).

Hyperalgesia (increased sensitivity to pain) and abnormal temporal summation are associated with central sensitization. Hyperalgesia is enhanced by dysregulation of pain modulation pathways responsible for reducing the intensity of pain signals in the spinal cord (Longley, 2006). Low cerebrospinal fluid levels of metabolites of three inhibitory neurotransmitters (serotonin, norepinephrine, and dopamine) have been reported in FM patients (Russell, Vaeroy, Javors, & Nyberg, 1992; Staud & Rodriguez, 2006; Wood, Patterson, Sunderland, Tainter, Glabus, Lilien, 2007) allowing an enhanced effect of excitatory neurotransmitters that are normally diminished centrally (Abeles et al., 2007). The hippocampus regulates dopamine levels and is adversely affected by high levels of corticotrophin-releasing hormone (Longley, 2006). Low levels of dopamine in pain processing pathways of the brain have been observed in FM patients. Temporal summation (wind-up) refers to the increased intensity of pain that normally occurs when it is experienced a second time. In FM patients, temporal summation is more intense. Sensations after the stimulus is gone are also more intense and last longer than expected (Staud & Rodriguez, 2006).

Neurohormonal abnormalities have also been observed in FM patients, specifically in the autonomic nervous system (ANS) and hypothalamus-pituitary-adrenal (HPA) axis, both of which play an important role in the stress response (Abeles et al., 2007; Longley, 2006; Martinez-Lavin & Vargas, 2009). Psychosocial stress has been identified as a potential trigger of FM, and can also enhance sensitivity to pain in persons with FM (Bradley, 2008; Okifuji & Turk, 2002). The ANS and HPA axis are normally triggered when a person is exposed to a stressor. These mechanisms mobilize body systems that enable what is commonly called the ‘flight or fight’ response that enhances a person's ability to respond effectively to the stressor. Sterling and Eyre (1988) defined this biological process of activation, mobilization and recovery from stress as allostasis—the additional effort required to regain homeostasis. Allostatic load is the term used to describe the impact of allostasis on the person's health and function (McEwen, 2007) Allostatic load is increased in situations when the response is maladaptive, such as when the stress management systems fail to respond or do not stop when the stress is over.

The neurohormonal abnormalities associated with FM contribute to a high allostatic load in persons with FM. Researchers have described evidence of basic sympathetic nervous system hyperactivity in persons with FM (Cohen et al., 2000; Martinez-Lavin, Hermosillo, Rosas, & Soto, 1998) along with a hypoactive response to stressors (Furlan et al., 2005; Raj, Brouillard, Simpson, Hopman, & Abdollah, 2000). This observation is consistent with a scenario of excessive stimulation of catecholamines (norepinephrine, epinephrine, and dopamine) which bind to adrenergic receptors that are responsible for recovery and return to homeostasis (Martinez-Lavin & Vargas, 2009). Defective clearing of catecholamines (possibly enhanced by defective COMT, D_3, and 5HTP genes) prevents the return to homeostasis and can lead to increased allostatic load and exhaustion (Gursoy et al., 2003).

Psychiatric comorbidity can also influence the development and severity of FM. FM is associated with depression and anxiety as well as posttraumatic stress disorder, panic disorder and obsessive compulsive disorder in a subset of patients (Arnold et al., 2006; Bradley, 2008). Depression, in particular, frequently co-occurs with FM and the relationship between the two is reciprocal—one not only contributes to the development of the other, but the presence of one can also increase impact and complicate treatment of the other (Maletic & Raison, 2009). In a longitudinal study examining the transition from widespread pain to FM in women (N = 214), Forseth et al (1999) reported that self-assessed depression was a significant predictor of FM. In another study exploring the impact of depression on FM pain, persons with FM pain (n = 74) who reported high levels of depression and anxiety had significantly worse physical function than those with non-FM pain (n = 48) (White, Nielson, Harth, Ostbye, & Speechley, 2002).

Co-occurance of FM with medical and psychiatric conditions highlights the possibility of shared biological mechanisms and pathways that can be negatively affected by environmental risk factors like stress. FM (and depression) also occurs more frequently in families, suggesting that genetics may play a role in the development of this disease. Genetic research of FM is relatively new and no specific genes have yet to be clearly identified as a factor that contributes to the development of FM. However, researchers have identified several genes governing the neurotransmitters that are associated with FM (serotonin, norepinephrine, dopamine and substance P). For example, Offenbaecher et al. (1999) examined the genotype for 5-HTT gene promoter region in both FM and control groups and found the 5HTTLPR short genotype more often in FM patients, who also had higher levels of depression. As noted earlier, variations in the cathechol-0-methyl transferaxe gene (COMT) which influence catecholamine metabolism and norephinephrine levels in the spine have also been reported in FM patients that can impair the stress response as well as the return to homeostasis (Gursoy et al., 2003).

This review of the research exploring the pathophysiology of FM suggests that, like most chronic conditions, FM is a complex condition and likely due to several, rather than one, biological, environmental or genetic factor. Allostasis, the ability to achieve stability through change, provides an appealing explanation of how these factors can contribute to the development of FM. If a person is chronically challenged by pain or stress, the allostatic load due to too much stress or ineffective allostatic mechanisms can lead to pathological changes in the body and the brain that further impair the allostatic response. Exploring factors that reduce the risk of allostatic load and promote allostasis in older adults living with FM will inform the development of effective treatments for FM as well as the other conditions that share these same biological, environmental and genetic mechanisms of disease. The next portion of the review will examine the research exploring FM in older adults.

FM in older adults. Yunus et al. (1988) were among the first to examine the experience of FM in older adults. They used a cross-sectional descriptive design to explore pain and other health-related measures in older and younger groups of persons with FM and found very few differences between any of the groups. The differences they did observe indicated that older patients reported longer duration of FM (14.2 $\pm$ 17 years vs. 7 $\pm$ 8 in younger persons), less anxiety/tension (55% vs. 73%, $p < 0.05$) and fewer chronic headaches (36% vs. 58%, $p < 0.05$). Pain symptoms were also less affected by mental stress in older patients ($p < 0.05$). Perhaps the most interesting finding in this study was that only 17% of the older patients and 26% of the younger patients had been diagnosed with primary FM prior to the study. The ACR criteria for FM had not been published at the time of this study, and these findings highlight how important the development of the criteria has been to enhance the research and treatment of FM. The study was limited by the small samples (older (n = 31), younger, (n = 63), but nonetheless was an important first step towards a better understanding the natural history of FM.

Canadian researchers also found that age was a risk factor for the development of disability in persons living with FM when they examined self-reported function and work disability in community dwelling adults (average age = 47.8 years). When persons living with FM (n = 100) were compared with 2 other control groups—persons with recent widespread pain (n = 76) and persons with no pain (n = 135)—the risk of disability was much higher for persons with FM (OR 4.0, 95% CI 1.71-9.36) (White, Speechley, Harth, & Ostbye, 1999a). However, this risk was significantly lower in persons over 65 years of age (OR 1.43, 95% CI, 0.19-10.96, $p < 0.05$. The authors speculated that the reduced risk could be evidence that symptom severity lessens with age or persons over 65 years no longer see themselves as disabled since they are retired. Their study partially supports this assertion about symptom severity. While they did observe decreased prevalence of FM with age, the severity of pain and fatigue did not appear to diminish.

In an effort to identify strategies that would enhance coping among young women struggling with FM symptoms, researchers examined older and younger groups of persons to determine if there were differences in symptoms, quality of life, roles, and coping (Burckhardt et al., 2001). They found that although symptom duration was significantly longer in older persons (n = 47), they had better scores on FIQ function and well-being than younger groups. Older adults also reported using more behavioral strategies for pain and had lower catastrophizing scores than middle aged (n = 243) and younger patients (n = 53). Although scores on the FIQ were lower in the older patients, suggesting less impact from the FM in this age group, there were no statistical differences in pain intensity between the three age groups. The researchers speculated that this may indicate that older adults, who have had the disease longer, have had an opportunity to learn how to cope more effectively with the symptoms. The cross-sectional nature of the study prevented exploration of the trajectory of FM to see if that indeed was happening. These findings do support the need to more fully explore the experience of FM in older adults to identify strategies that would help younger persons cope more effectively with this disease.

Cronan et al. (2002) conducted a study of persons receiving care from a health maintenance organization (N = 600) to more fully examine the age-related differences that have been observed in the FM population. Using a cross-sectional design, they examined comorbidity, pain, depression, sleep quality, illness impact, health status, coping, self-efficacy, helplessness, and care utilization in three age groups (young, 20 – 39 years, n = 58; middle aged, 40 – 59 years, n = 349; older, 60 – 85 years, n = 189). The older group had significantly more comorbidity and longer duration of FM than the younger groups, but also reported significantly better sleep, less pain, depression, and impact ($p < 0.001$). Interestingly, scores on the psychosocial variables (coping styles, self-efficacy, and helplessness) did not differ between groups, nor did they mediate the relationship between age and symptoms. The researchers suggested that these differences may be related to perceptual differences, or different expectations about health between age groups. They further suggested that FM symptoms may be more acceptable to older adults who see them as a normal aspect of aging, and more distressing to younger people who have less experience with illness themselves or with their peers. The authors acknowledged the limitations of this cross-sectional study including the use of self-reported measures and a convenience sample. Despite these limitations, the study's large sample size and inclusion criteria that required use of ACR 1990 classification criteria and physician diagnosis strengthen the findings for this aggregate and invite further research exploring factors that might explain the reported age-related differences in FM impact.

Recently, a study was conducted to explore FM symptom clusters in older adults and the impact of these symptoms on physical function (Shillam, 2008). The convenience sample was drawn from persons 50 years and older who had participated in previous FM clinical trials (N = 171). The researcher found that pain severity explained 23% of the variance in physical function, but neither age nor comorbidity moderated this relationship, which was unexpected. The sample was also divided into two age groups, 50 to 64 years of age (n = 114) and 65 years and older (n = 57) to examine differences between these age groups. The mean number of symptoms and overall impact was greater in the younger group, findings that are consistent with other studies mentioned earlier. However, levels of physical function were the same in both groups, which was not seen in other studies. This finding may be due to the instrument used to assess physical function, The Late Life Function and Disability Index. It was developed specifically for use with older adults, correlates with measures of physical performance, and may be more sensitive in detecting difficulties in older adults than tools used in other studies with both young and old population (Haley et al., 2002; Jette, Haley, Coster et al., 2002). Despite the limitations associated with cross-sectional study and convenience sampling, the findings support the need for further exploration into the relationships between FM pain and physical function.

Although there is not a large body of evidence regarding the relationship between FM pain and physical function in older adults, there does appear to be variation in the relationship between FM pain and its impact on physical function. It is not clear from this evidence if there is an age-related effect on pain perception but in the general population the prevalence of pain in general appears to increase to age 75 and then stabilize in old age (Andersen et al., 1999; Helme & Gibson, 2001; Leveille et al., 2001; Thomas et al., 2006; Thomas, Peat, Harris, Wilkie, & Croft, 2004). Some have speculated that this stabilization in pain reports after age 75 may be due to an age-related physiological sensory change that diminishes pain perception and behavior in the same way that age-related declines in sensory function diminish vision and hearing (Harkins, 2002; Helme & Gibson, 2001). However, research exploring the effect of aging on experimental pain revealed that declines in sensory function did not appear to significantly reduce the sensation of pain in the same way they affect vision and hearing in older adults (Harkins, 2002). This suggests that the effect of psychosocial factors such as cognitive appraisal, experience with pain, and cohort effects may better explain the stabilization of pain prevalence in persons over 75 years of age (Harkins, 2002). The stabilized prevalence of pain in persons over 75 years of age may also reflect lower levels of incidence (new pain) in older adults and increased duration of persistent pain (Thomas et al., 2006). The increased duration of pain in older adults is consistent with the research of FM in older adults (Burckhardt et al., 2001; Cronan et al., 2002; Yunus, Holt, Masi, & Aldag, 1988)

The impact of pain on physical function does appear to increase with age. Thomas et al. (2007) explored the effect of age on pain prevalence and pain-related interference over a period of 3 years in adults 50 to 80+ years of age (*N* = 4234). They found that while pain prevalence did not increase with age, pain-related interference with daily life did. Seventy-two percent reported persistent pain that interfered with life and new reports of interference with daily life increased with age. Nearly 20% reported new onset of pain interference and reports were more common in women and in persons over 80 years of age than those 50 to 59 years of age. However, the relationship between pain and interference was not linear—there were many who maintained their ability to function despite pain. This has also been identified as a possible trend in older persons with FM and deserves further study.

This review of the FM literature supports the proposal to explore factors that influence the relationship between FM pain and physical function. There is evidence of a relationship between FM pain and physical function, but it is not clear why older adults report less impact than younger persons. The multidimensional nature of FM pain suggests that there may be important psychological factors that can influence the relationship between pain and physical function. Research to identify factors that can influence this relationship will enhance our ability to reduce the risk of functional problems and promote health in a growing number of older adults.

Physical Function

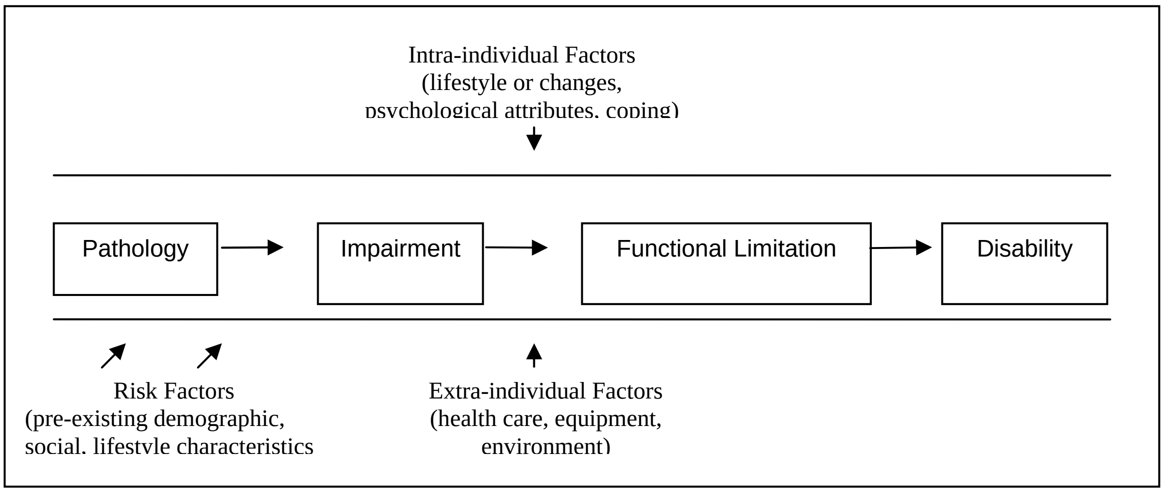
Definition. Physical function is defined as a person's ability to complete specific actions or activities that are part of daily routines and require gross or fine motor operations (Haley et al., 2002; Jette, Haley, Coster et al., 2002). Difficulties in physical function can lead to difficulties with role actions and in turn with the ability to participate in life activities. These difficulties also contribute to the development of disability, a gap between personal capability and the activity's demand (Verbrugge & Jette, 1994).

A variety of disablement models have been developed to illustrate the relationships between the concepts believed to lead to disability and guide the research exploring relationships between them. Nagi (1976, 1991) was the first to introduce the idea of a disability pathway that identified a sequence of three pathological events that could potentially contribute to the development of disability. The first step in the pathway, pathology, describes any abnormal cellular processes that can lead to the second step, impairment in bodily function such as FM pain, weakness, or de-conditioning. These impairments contribute to the third step by impacting physical function resulting in functional limitations (difficulty walking, standing up, climbing stairs). The functional limitations precede the 4th and final step of the pathway—disability, which is defined as a gap between a person's ability to participate in activities, e.g., ADLs or IADLS, and meet social and physical environmental demands. The model was intended to demonstrate how the interaction between the person and environment may or may not result in disability, and inform the development of strategies that could prevent disability by addressing problems on the pathway that preceded or predicted the development of disability.

Verbrugge and Jette (1994) expanded Nagi's model by clarifying the descriptions of the four elements of the pathway and introducing factors believed to mediate or moderate the relationships between the elements of the disablement pathway (Figure 2). Risk factors are pre-existing conditions that can influence the process of disablement such as lifestyle behaviors, age, gender and other demographic variables. Extra-individual factors are those that exist outside of the person, the physical and social context of a person's life (e.g., health care services and social support networks). Intra-individual factors believed to influence the disablement process include behavioral changes, psychosocial attributes, coping styles, and accommodations to changes in ability.

More recent adaptations of the disablement process focus on refining the

Figure 2. Disablement Process (Verbrugge & Jette, 1994)



definition and measurement of the elements and also clarify the dynamic nature of the disablement process (Bennett, Winters-Stone, & Nail, 2006; Stewart, 2003; World Health Organization, 2001). For example, there is evidence that self-report and objective performance measures of functional limitations are both important unique predictors of functional decline, disability, and nursing home placement, and appear to measure different dimensions of physical function (Reuben et al., 2004a, 2004b; Simonsick et al., 2001). Self-reported measures more accurately reflect an individual's subjective assessment of *capacity* which is related to but conceptually very different from *actual* performance (Reuben et al., 2004b; Simonsick et al., 2001). The perception of one's ability to function is particularly sensitive to recent health problems, such as pain or falls, and can contribute to further limitations if a person's confidence or motivation to engage in activities is diminished (Daltroy, Larson, Eaton, Phillips, & Liang, 1999). There is also evidence that subjective awareness of decline in physical function is often preceded by declines in objective functional performance (Seeman, Unger, McAvay, & Mendes de Leon, 1999; Stewart, 2003). Fortunately, movement among the elements of the disablement process is not one-way. Transitions from ability to disability and back is a common experience for many older adults (Hardy & Gill, 2005).

Many older adults live with potentially disabling factors yet have the capacity to recover from disability and live independently in the community (Femia, Zarit, & Johansson, 2001; Fredman, Hawkes, Black, Bertrand, & Magaziner, 2006; Gill, Robison, & Tinetti, 1997; Hardy & Gill, 2005). The Disablement Process provides an important multidimensional framework to guide research exploring factors that influence decline as well as improvement of physical function in community-dwelling older adults living with FM.

Physical function in older adults. This portion of the review was conducted to examine what is known about self-reported physical function in older adults and theorized demographic and health-related factors associated with it. Inconsistent definition and measurement of the dimensions of physical function complicated the search process. In order to promote consistency in terms, the terms used in each study to describe physical function in older adults were categorized to correspond with the dimensions identified in the Disablement Process (Lawrence & Jette, 1996; Nagi, 1991; Verbrugge & Jette, 1994). The search process focused on reviews or studies of community-dwelling older adults that examined correlates or predictors of dependent variables conceptually equivalent to self-reported physical function, defined as self-reports of difficulty completing specific actions or activities that are part of daily routines and require gross or fine motor operations (Haley et al., 2002; Jette, Haley, Coster et al., 2002). Conceptually similar variables included terms such as self-reports of mobility, functional limitations, physical functioning, mobility limitation, self-reported physical function. The studies discussed in the review are displayed in Appendix A (Tables A1 through A9).

Demographic variables and physical function. This section of the review will explore the literature regarding the relationships between selected demographic variables and physical function.

Age. Physical function is dependent upon the interaction of multiple physiologic systems (e. g., musculoskeletal, nervous, sensory, cognitive and cardiovascular systems) that can be negatively affected by advancing age (Ferrucci et al., 2000). It is not surprising then that both the prevalence and risk of difficulty with physical function increases with age (Stuck et al., 1999). The studies summarized in Appendix A (Table A1) support this observation.

Determining the prevalence of difficulties with physical function is an imprecise science but has been reported to range from 3% to 47% in older adults (Gill, Allore, Hardy, & Guo, 2006; Guralnik et al., 1993; Miller et al., 2004; Shumway-Cook, Ciol, Yorkston, Hoffman, & Chan, 2005). Shumway-Cook et al. (2005) examined responses to the 2001 Medicare Current Beneficiaries Survey (MCBS) and found that 47% reported a mobility limitation. While this may seem encouraging, they also reported that levels of difficulty increased with age, an observation that has been reported by others (Guralnik et al., 1993; Lawrence & Jette, 1996). Age also negatively affects transitions between ability to disability, which occur more frequently in older adults than one might expect. Gill et al. (2006) examined transitions between four levels of mobility disability (no disability, intermittent, continuous, death) and found high frequency rates of decline as well as recovery in community-dwelling older adults. However, advanced age was associated with transitions to increased disability and less likelihood of improvement.

As noted earlier, the impact of pain on physical function occurs in much younger persons who have FM, but impact also appears to increase with age in this population. Jones et al. (2008) reported in their survey of women with FM (N=1735) that age had an inverse relationship with self-reported physical function. Sixty-six percent of women ≤ 30 years of age reported low function and this percentage increased to 88% in women >70 years of age. The research provides substantial evidence that age is a predictor of difficulties with physical function and should be examined in this study as a correlate of physical function. Longitudinal studies also suggest that persons with advanced age live with increased risk of difficulties with physical function and dynamic transitioning back and forth between independence and disability appears to be a fairly common experience for many older adults (Gill et al, 2006).

Gender. FM has been reported in women more often than men. The ratio between females and males has been reported to be approximately 9:1 in a clinic population, 7:1 in a community population (Wolfe et al., 1995). Women in general report more problems with physical function and experience higher incidence of disability than men (Merrill, Seeman, Kasl, & Berkman, 1997; Murtagh & Hubert, 2004; Schoeni, Martin, Andreski, & Freedman, 2005; Wood et al., 2005). It is not clear, though, if this is a function of gender directly or due to other health-related factors associated with female gender (low mortality and high comorbidity). Although women tend to live longer than men, they also have a higher prevalence of nonfatal conditions (e.g., arthritis and chronic pain conditions like FM) that can negatively impact a person's physical function in old age (Centers for Disease Control and, 2006; Crimmins, Kim, & Hagedorn, 2002; Rustoen et al., 2004; Verbrugge & Juarez, 2006). Murtaugh and Hubert (2004) substantiated this disparity and the influence of these diseases that exacerbate risk for problems in women (See Appendix A-Table A2). Physical activity may also explain some of this disparity because men who are more physically active have fewer problems with mobility (Lawrence & Jette, 1996). Although the mechanism of action is uncertain, gender is an important variable to consider when interpreting the findings in this study since most people with FM are women.

Education. Although there is evidence of a "compression of morbidity" (decreasing phase of morbidity preceding death in older adults), it appears that this is true more often for persons with higher levels of education (Coppin et al., 2006; House, Lantz, & Herd, 2005; Zimmer & House, 2003). This is not surprising when you consider that exposure to education usually occurs early in one's life when it is possible to influence lifestyle behaviors (smoking, alcohol abuse, physical inactivity, poor nutrition) and exposure to disease that can impact physical function in later life (Melzer, Izmirlian, Leveille, & Guralnik, 2001; Stuck et al., 1999). Education may have also influenced an older adult's access to health care at a younger age. In the United States, health care is available primarily through employment which is often affected by educational level.

Education is strongly associated with onset of physical function problems, much more so than the actual progression of problems with physical function (Melzer et al., 2001; Zimmer & House, 2003). Lower educational level has also been identified as a risk factor for FM (White et al., 1999b). Because physical function is believed to precede the development of disability and low levels of education have been associated with the incidence of both mobility problems and disability, it is important to examine the relationship between education and physical function in community-dwelling older adults.

Income. Income is another socioeconomic factor that can influence physical function. Zimmer and House (2003) analyzed data from the Americans' Changing Lives survey, a longitudinal study of American adults over 25 years of age (*N* = 3617) to identify predictors of onset and/or progression of functional limitations and found that income predicted both onset and progression. Persons with low income were more likely to experience the onset of functional limitations and less likely to improve over time (House et al., 2005; Zimmer & House, 2003). Guralnik et al. (1993) also found that low income predicted increased risk of mobility losses in both men and women, even after controlling for comorbidities. White et al. (1999b) reported that low income was a risk factor for the development of FM. These findings are not surprising given that persons with less income also have fewer resources available for the assessment and treatment of functional problems. Income is also an important socioeconomic variable to include in this study.

Tangible social support. Social support is a key element of successful aging (Rowe & Kahn, 1998), a complex construct that has many dimensions such as social structure/network, emotional support, tangible support, perceived support and negative interactions (Krause, 2001; Neugebauer & Katz, 2004). The relationship between health and social support varies based on the dimension of support. For example, satisfaction and emotional social support are more often associated with depression and well-being than is tangible social support. Tangible social support involves helping a person perform instrumental activities such as daily tasks, transportation, or meal preparation which is important to persons who have difficulties with pain or perceived mobility. Weinberger (1990) found that tangible support was modestly associated with physical function in adults older adults living with arthritis ($r=-.21$, $p<0.001$). DesMeules et al (2004) found that disabled women experience a higher proportion of disability related to chronic pain and mobility problems and have less tangible social support than disabled men. This gender gap was even higher in older age groups. Tangible support allows a person living with pain to focus their energy on valued activities. In a longitudinal study of persons living with RA ($n=404$), individuals who reported greater satisfaction with the level of help received with daily tasks in year 1 had fewer valued activities newly affected from year 1-2 (Neugebauer & Katz, 2004).

Similar negative relationships between pain and social support have also been reported. Meana, Cho, and DesMeules (2004) found that chronic pain was more likely when tangible social support was low. Kelsen et al (1995) reported a statistically significant negative association between pain intensity and social support in patients with newly diagnosed pancreas cancer ($r=-0.28$, $p=0.028$). Osborne et al (2007) also found that as perceived social support increased, pain interference decreased in persons living with MS and pain ($r= -0.30$, $p<0.01$). The evidence suggesting a positive relationship between tangible social support and physical function supports the decision to examine it as a predictor of physical function in older adults living with FM.

Health-related variables and physical function. This section of the review will explore the literature regarding the relationships between selected health-related variables and physical function.

Comorbidity. The influence of disease on the development of functional impairment and limitations that lead to disability has been well-documented in the disablement process. Comorbidity (the presence of more than one disease in an individual) exacerbates difficulties with all dimensions of physical function in older adults as well as their ability to recover (Femia et al., 2001; Fried & Guralnik, 1997; Peek, Ottenbacher, Markides, & Ostir, 2003; Wang, van Belle, Kukull, & Larson, 2002). Physical function is particularly sensitive to comorbidity (See Appendix A-Table 12). A greater number of chronic conditions is associated with increased risk of mobility problems in older adults (Guralnik et al., 1993) and diseases like diabetes mellitus, stroke, depressive symptoms, hip fracture, and knee pain negatively impacted an older person's potential for recovery (Miller et al., 2004).

Nearly two thirds (65%) of older adults live with more than one chronic condition (Wolff et al., 2002) and this proportion is expected to grow as more people survive conditions that were previously considered fatal. Recent trends indicating decreased prevalence of disability despite an increased prevalence of disease are encouraging (Crimmins, 2004) but comorbidity remains an important variable to include in this study of predictors of physical function. As noted earlier, FM is associated with comorbidities that can negatively impact physical function—fatigue, sleep disturbance, headache, irritable bowel syndrome, mood disorders, morning stiffness and cognitive difficulties (Abeles et al., 2007; Katz et al., 2006; Mease et al., 2007). It is important to consider the synergistic effects of multiple diseases which can be greater than the effect of the individual diseases on physical function and increase a person's overall vulnerability to other factors that may also affect physical function (Fried & Guralnik, 1997).

Depressive symptoms**.** Depression in older adults is associated with significant impact on physical function in all ages, but especially in older adults who live with chronic pain (National Institute of Mental Health, 2007). The relationship between pain and depression appears to be reciprocal—the number of depressive symptoms increases when pain is moderate to severe and impacts physical function, and, likewise, when a depressed person experiences pain, complaints and impact on function are higher than in non-depressed persons (Bair et al., 2003). Similar findings about the relationship between depressive symptoms and physical function have also been reported in older adults who don't meet the full diagnostic criteria for depression—the number of depressive symptoms also predicts functional problems (Cronin-Stubbs et al., 2000; Penninx et al., 1998). In a 4-year prospective cohort study of older adults (N=1286), researchers found a positive relationship between increasing levels of depressive symptoms and decline in physical performance in community-dwelling older adults (Penninx et al., 1998). Cronin-Stubbs et al. (2000) studied community-dwelling older adults (N=3434) over a 6 year period and found that the potential for disability increased with each additional depressive symptom (*OR* = 1.16 per symptom, 96% confidence interval, 1.13 – 1.19). They also observed a negative relationship between number of depressive symptoms and likelihood of recovery from disability. Because depression frequently co-occurs with FM (Arnold et al., 2004) and there is evidence that depressive symptoms predict difficulties with physical function in older adults, it is important to examine depressive symptoms as a predictor of physical function in older adults living with FM.

Body mass index. Inadequate nutrition and age-related body composition changes, particularly those affecting the musculoskeletal system, can significantly diminish a person's ability to function (Apovian, 2000; Bates et al., 2002). Body mass index (BMI) is an important indicator of nutritional status in older adults and both extremes of BMI (underweight and obese) have been associated with higher rates of mortality and morbidity in older adults (Corrada, Kawas, Mozaffar, & Paganini-Hill, 2006; Galanos, Pieper, Cornoni-Huntley, Bales, & Fillenbaum, 1994; Inoue, Shono, Toyokawa, & Kawakami, 2006; Newman et al., 2001; Stevens et al., 1998; Villareal, Apovian, Kushner, & Klein, 2005). Underweight in older adults (BMI < 18.5) can result from several factors, including inadequate dietary intake, disease, or sarcopenia (age-related loss of skeletal muscle mass) (Apovian, 2000). Loss of skeletal muscle mass is an important predictor of physical disability in older adults. Persons with severe levels of sarcopenia, approximately 10% of the older adult population, have two to five times the risk of disability than do older adults with normal muscle mass (Janssen, 2006) (See Appendix A-Table A6).

Obesity (BMI > 30) also threatens an older adult's mobility because it can accelerate functional problems associated with age-related decreases in muscle mass and strength (Kennedy, Webb, & Chokkalingam, 2005; Villareal et al., 2005). The term 'sarcopenic obesity' describes the condition that results from age-related loss of skeletal muscle mass (sarcopenia) and increased fat mass that results from obesity as well as the age-related loss of muscle mass (Kennedy et al., 2005). The risk for functional limitation is significantly higher in persons with BMI > 30 (Larrieu et al., 2004). FM patients tend to be overweight (Jones et al., 2008; Neumann et al., 2008) and a positive relationship between age and BMI in FM patients has been reported (Yunus, Arslan, & Aldag, 2002). Weight loss also predicted improvement in problems with pain interference in a pilot study of overweight and obese women with FM, so BMI is another important variable to include in this study of older adults living with FM (Shaver, Wilbur, Robinson, Wang, & Buntin, 2006).

Physical activity. Although participation in physical activity tends to decrease with age, the benefits to overall health and physical function from regular physical activity do not (Mazzeo et al., 1998). A longitudinal study of older adults (National Institute of Aging Established Populations for Epidemiologic Studies of the Elderly (EPESE), N = 6981) revealed that high levels of physical activity (walking, gardening or vigorous exercise 3 or more times/week) reduced the risk of mobility loss by 40% (LaCroix, Guralnik, Berkman, Wallace, & Satterfield, 1993)(See Appendix A-Table A7). This benefit was evident in persons with and without chronic illness at baseline and did not vary by type of physical activity.

Even minimal levels of physical activity have been shown to slow the loss of mobility in older adults. Miller et al. (2000a) reported that low levels of physical activity (walking 1 mile/week) protected against declines in later assessments and the beneficial effect was not affected by disease or change in dosage. Physical activity is also associated with other factors that can influence physical function. Physical activity can indirectly affect physical function through direct effects on self-efficacy and objective mobility (McAuley et al., 2006).

Physical activity plays an important role in physical function and the prevention of disability in community-dwelling older adults (Rejeski, Brawley, & Haskell, 2003). Women with FM report low physical activity levels (Shaver et al., 2006), but exercise is encouraged because of demonstrated improvements in function (Busch, Barber, Overend, Peloso, & Schachter, 2007). It is an important variable to examine in this study of physical function in older adults living with FM.

Pain. Chronic, persistent pain is a biopsychosocial phenomenon that is highly prevalent in older adults living with FM and can negatively impact physical function (A. G. S. Panel on Persistent Pain in Older Persons, 2002; Hadjistavropoulos et al., 2007; Jones et al., 2008; Leveille et al., 2001; Scudds & Ostbye, 2001). The challenges regarding the conceptualization and measurement of physical function also make it difficult to define and measure pain. Pain is a perception and the person's self-report of pain is the most reliable indicator of its presence. The descriptions of physical, sensory and emotional aspects of the experience help to characterize the pain and are important elements of a pain assessment. However, inconsistent measurement of pain and/or these characteristics make comparisons across studies difficult. Nonetheless, there is a growing body of evidence for relationships between pain characteristics and physical function to support the assertion that pain is a predictor of physical function in older adults (See Appendix A-Table A8).

Several cross-sectional studies have provided evidence of a relationship between pain and pain interference that is influenced by age, comorbidity, dose (pain intensity), and location. Scudds and Ostbye (2001) examined the extent of pain (during the past 4 weeks) and pain-related disability in Canadians 70 years of age and older (*N* = 5703) and found that 53% reported pain. In this group (*n* = 3048), interference with moving increased with age, number of chronic conditions, cognitive impairment, and pain intensity. For example, only 10% reporting mild pain also reported moderate interference with moving about, but this percentage jumped to nearly half (45%) in those with higher pain intensity (moderate-severe pain). Thomas et al. (2004) studied pain prevalence and interference in older adults 50 years and older over a 3 year period (*N* = 11,230) and also found that, although overall pain prevalence remained constant with age, persons over 80 years of age experienced significantly higher incidence of pain and pain-related interference than their younger counterparts. The prevalence in hip, knee, and foot pain increased with age as did pain interference with daily life. A follow-up study (Thomas et al., 2006) revealed that nearly half of those who did not report pain at baseline reported it three years later and the persistence of pain interference identified at baseline was high (72.1%).

Lichtenstein et al. (1998) examined the relationships between pain dimensions (location, intensity, frequency) and physical function (difficulty with upper and lower extremity tasks) in community-dwelling older adults 65 to 79 years of age (*N* = 833). They also found high prevalence of pain—nearly half (46%) reported pain—and there was a statistically significant difference in difficulties between those with pain and those without (Wilcoxon test, $p = 0.0001$). They further found that each dimension of pain in those reporting pain (*n* = 373) contributed independently to difficulties with physical function and together the three pain dimensions accounted for 20% of the variance in physical function. Pain location explained the largest portion of this variance (9 to 14%) and the most frequently identified painful areas involved the musculoskeletal system, areas often affected by arthritis. This is consistent with the research indicating that the impact of pain increases with the number of locations and that widespread pain is a strong predictor of problems with physical function (Leveille et al., 2001). Pain intensity was also associated with difficulty with physical function, accounting for 5 — 6% of the variance in physical function, and exhibited a dose-response relationship with the composite score of physical function (Edwards, 2006; Weiner et al., 2003).

Pain also explains the effect of medical conditions on physical function and other dimensions of physical function in older adults (Bennett, Stewart, Kayser-Jones, & Glaser, 2002). Bennett et al. (2002) were among the first to explore the relationships between medical conditions, symptoms, and functioning in older adults (N = 249). They found that the relationship between medical conditions and physical function changed from moderate to small when pain and fatigue were added to the model, indicating that these two symptoms mediate (explain) the effect of medical conditions on physical function.

Pain is a constant companion to older adults with FM (Mease et al., 2008). Further, its presence increases the risk of difficulties with physical function. Research exploring factors that moderate the relationship between FM pain and physical function in older adults is needed to enhance quality of life and independent living.

Resilience

Definition of Resilience. Resilience is a personality characteristic that moderates the negative effects of stress and promotes adaptation (Wagnild & Young, 1993). It describes a person's capacity to recover from adversity and is similar to the concept of psychosocial coping (Dyer & McGuinness, 1996; Rutter, 1993). Resilience is not a static "constellation of traits" (Jacelon, 1997, pp., p.126), but rather a characteristic that has the potential to develop over one's lifetime (Tusaie & Dyer, 2004). Interestingly, the avoidance of stress does not contribute to the development of resilience. Rather, encountering stress and successfully coping contributes to the development of resilience, just as immunizations can stimulate the immune response and development of immunity (Rutter, 1993). In the context of allostasis, resilience strengthens a person's ability to return to homeostasis and ultimately reduces the risk of allostatic load.

There are several neurobiological factors believed to contribute to the development of resilience. Resilient persons also have a healthy sympathetic nervous system that is characterized by low levels of catecholamines, rapid increase during stress or challenge, and rapid return to baseline. Identifying and correcting specific factors contributing to a maladaptive stress response can promote resilience. For example, low levels of serotonin are associated with depression and helplessness. Restoring normal levels of serotonin reduces these symptoms and enhances resilience (Bonne, Grillon, Vythilingam, Neumeister, & Charney, 2004). Other factors that are associated with a resilient response to stress include Neuropeptide Y (NPY) and DHEA. NPY is an amino acid that is released with norepinephrine to inhibit continued release of norephinephrine. Low levels of NPY have been observed in veterans with PTSD (Rasmusson et al., 2000) and high levels in highly resilient special operations soldiers after extreme training (Morgan et al., 2000). DHEA is an antiglucocorticoid that is simultaneously released with cortisol as part of the HPA axis to control the level of circulating cortisol

(Southwick, Vythilingam, & Charney, 2005). Maintaining low levels of glucocorticoids protects the hippocampus, an important structure in the brain that is involved in memory, stress modulation and nociception. Interventions designed to support or restore biological processes that promote recovery of homeostasis also promotes resilience and reduce the risk of allostatic load (Wood, Ledbetter, & Patterson, 2009).

Psychosocial factors also promote resilience by enhancing a person's ability to respond successfully to stress. Scholars have identified several resilient factor that are cultivated within an individual (intra-individual) and outside of the individual (extra-individual). Intra-individual resilience factors include emotional and psychological qualities such as optimism, humor, intelligence, creativity, belief in a system that has existential meaning, self-efficacy, and effective coping strategies (Jacelon, 1997; Olsson, Bond, Burns, Vella-Brodrick, & Sawyer, 2003; Werner, 1995). Positive emotions like optimism and humor are believed to decrease autonomic arousal and encourage creativity and flexibility that, in turn, enhance a person's ability to cope with stress (Fredrickson, 2001). Extra-individual factors are those encountered in families and in the larger social environment. Family factors include qualities such as parental warmth, close relationship with caring adult, and cohesion within the family (Olsson et al., 2003; Rutter, 1985; Werner, 1995). Success at school, adequate provisions, and support are examples of extra-individual environmental factors (Olsson et al., 2003; Rutter, 1985; Werner, 1995).

Polk (1997) developed a nursing model of resilience that describes four related but distinct and observable patterns of these protective factors believed to reveal an individual's larger innate pattern of resilience. The dispositional pattern includes physical and psychosocial factors such as intelligence, pleasing temperament, self-confidence, self-esteem, and self-efficacy that contribute to personal competence and good health. Relational pattern factors are those that enhance positive interactions with others such as being able to reach out to others in time of need and commitment to roles and relationships. The situational resilience pattern describes qualities like a person's ability to assess a situation, act, and appreciate the consequences of the action. Factors associated with this pattern include flexibility, resourcefulness and an internal locus of control. The philosophical pattern is expressed in personal beliefs about the meaning and purpose of one's life and the ability to maintain an optimistic, balanced perspective about events. Elements of the four patterns are described more fully in Table 1.

Table 1. Resilience Patterns (Polk, 1997)

Pattern	**Description**
Dispositional (physical and ego-related psychosocial attributes)	Good health, good physical appearance, temperament that elicits positive attention in childhood Athletic competence Intelligence, sense of mastery, self-worth, self-efficacy, self-esteem, self-reliance
Relational (roles and relationships)	Close confiding relationships Social network Positive role models Deep commitment to relationships, intimacy Multiple interests, jobs, hobbies Education, social activities Seeks community support
Situational (approach to situations/stressors)	Cognitive appraisal skills, problem-solving Capacity for action Awareness of ability, consequences of action Flexibility, perseverance, resourcefulness Creativity, curiosity, exploring nature
Philosophical (personal beliefs)	Values self-knowledge, reflective Optimistic, finds positive meaning Life is worthwhile, has purpose Life path is unique Maintains balanced perspective

Polk's model is consistent with Newman's (1994) belief that nursing should focus less on treating illness symptoms and more on recognizing patterns of interaction that are associated with health. Interactions between stressors and protective factors are the essence of resilience (Roosa, 2000). The challenge lies in developing instruments capable of measuring the complex construct of resilience that can be used to study these theoretical relationships in older adults.

Wagnild and Young (1990) responded to this challenge and were among the first to examine resilience as an innate multidimensional characteristic in older adults. Using a grounded theory approach, they interviewed 24 elderly women who exhibited signs of successful adjustment after a loss and identified five distinct themes in the data that characterized resilience. The first, *equanimity*, describes the older woman's ability to maintain a balanced perspective, to have the capacity to recognize both joys and sorrows in her life. The second was *perseverance*, the desire to keep going despite adversity and to remain involved in society. *Self-reliance*, a characteristic associated with confidence and belief in oneself, was the third theme identified by the investigators. The fourth theme was *meaningfulness*—the ability to derive meaning from the adversity and recognize opportunities for growth. The fifth and final theme identified in the data was described by the researchers as *existential aloneness*—the understanding that one's life journey is ultimately unique despite shared experiences. These themes are consistent with Polk's model that identifies patterns underlying the multidimensional construct of resilience. The researchers developed items reflecting these themes to construct the Resilience Scale, a quantitative measure that provides an overall score of resilience by assessing each of these qualities in a person (Wagnild & Young, 1993). The development of the Resilience Scale has been an important contribution to the study of resilience in older adults.

Resilience protects psychological function (Jacelon, 1997; Polk, 1997; Tusaie & Dyer, 2004; Wagnild & Young, 1993). Since FM pain is a stressor and psychosocial dimensions are inherent in both pain and physical function, it is quite possible that resilience can moderate the impact of pain (stress) and promote physical function (adaptation). The remainder of this section of the review will explore what is currently known about resilience in older adults and its relationship with theorized correlates of physical function.

Resilience in older adults. Inconsistent definition and lack of valid and reliable measures of resilience in older adults have limited the measurement of the concept and slowed the development of this research. A search of electronic databases (Medline, CINAHL, PsychInfo) using the combination of key words ‘resilience and older adult’ yielded 47 articles. However the majority were eliminated because they used the term resilience as a descriptive word in the text of the article rather than as a concept or variable of interest. Of the nine studies retrieved in the review, only three used the same measure of resilience (Nygren et al., 2005; Wagnild, 2003; Wagnild & Young, 1993) and one of those used a version of the Resilience Scale that had been translated into Swedish.

Despite these conceptual and measurement challenges, seven studies were identified that explored resilience and it correlates in older adults. Most of the evidence focused on psychosocial correlates of resilience and revealed modest or moderate correlations with self-rated, subjective general health and well-being (Bowen, Morasca, & Meischke, 2003; Hardy, Concato, & Gill, 2004; Montross et al., 2006; Wagnild, 2003;

Wagnild & Young, 1993) along with moderately strong negative correlations with depression (Hardy et al., 2004; Wagnild & Young, 1993). Less is known, however, about the relationships between resilience and physical function or other demographic and health-related variables that also theoretically correlate with physical function.

Levels of resilience. The prevalence of resilience in older adults has not been measured but given the levels of resilience in older adults reported in the literature prevalence may be fairly high. The authors of the Resilience Scale identified a score of 147 to 175 as high, and three studies reported scores that were at or near the point that distinguished mid-range scores from high scores (Nygren et al., 2005; Wagnild, 2003; Wagnild & Young, 1993). Researchers using other measures also reported fairly high levels of resilience in older adults. Bowen (2003) measured resilience in women with a family history of breast cancer by calculating a summed score of three psychosocial measures and reported a mean score that indicates a fairly high level of resilience ($\overline{X}$ = 7.8/10). Hardy et al. (2004) administered the resilience module of the Asset and Health Dynamics (AHEAD) study to community dwelling older adults and found that 71% of the population scored in the intermediate to high levels of resilience. Montross et al. (2006) used the Connor-Davidson Resilience Scale to examine the relationship between resilience and successful aging in community-dwelling older adults. They also found moderately high levels evidenced by scores ranging from 73-75 on a 100-point scale. Low levels of resilience were reported in only one study and this may be due to the sample that was limited to persons with pain. Karoly and Ruehlman (2006) found that only 13% (N = 2407) of the persons in the parent study of persons living with chronic pain met their criteria for resilience, having defined resilience in a group of adults living with chronic pain as "high pain severity in the context of low interference and low emotional burden" (p. 91). These moderate to high levels of resilience in older adults are not surprising if one accepts that resilience develops from coping successfully with stressors. Most older adults have faced some adversity in their lifetimes and aging adds even more stressors (Crimmins, 2004; Fried, 2000; Miller, 2008).

Demographic variables and resilience. This section of the review will explore the literature regarding the relationships between selected demographic variables and resilience.

Age. Given that advanced age is associated with multiple stressors such as bereavement, retirement, chronic illness, and functional limitations, interest in studying resilience in older adults is growing. Because resilience is conceptualized as a construct that develops in response to successful coping with stressors (Rutter, 1993), it would be logical to assume that older adults have more opportunities over their lives to develop resilience. However, current studies provided minimal and somewhat conflicting evidence about the relationship between age and resilience (See Appendix A-Table A9). Talsma (1995) found that age was significantly and negatively associated with resilience. However, Bowen et al. (2003) found that age was positively associated with resilience. This discrepancy may be related to the fact that Bowen's study was limited to women and included persons younger than 65 years. However, Nygren et al. (2005) also found that the resilience mean score in the older persons he studied was higher than those reported in younger persons. Given the limited and conflicting evidence about the relationship between age and resilience, further study is warranted.

Gender. There are significant gender differences regarding health in older adults. Men have a shorter life expectancy but women experience higher rates of functional limitations and disability that can significantly diminish physical and psychological function and health-related quality of life (Murtagh & Hubert, 2004; Smith & Baltes, 1998). Less is known about the relationship between resilience and gender, but the evidence suggests that there may also be gender disparities regarding resilience (See Appendix A-Table A10). Hardy et al. (2004) found male gender was significantly associated with resilience in bivariate analyses but this association did not remain significant after adjustment for other significant variables. Talsma (1995) reported that female gender was negatively associated with resilience in her study of community-dwelling older adults who also had higher levels of disease. Although the other studies did not find significant correlations between gender and resilience, women scored lower than men and were less represented in groups associated with resilience (education, income) (Nygren et al., 2005; Wagnild, 2003; Wagnild & Young, 1993). The limited amount of evidence suggests that there may be a gender disparity regarding resilience. Further study of the relationship between gender and resilience is warranted to clarify this relationship.

Education. Education is a strong determinant of healthy aging (House et al., 2005). This is especially evident in research examining determinants that influence whether or not health is maintained or worsens with age. Higher levels of education are associated with better health and this disparity associated with education appears to persist despite reported improvements in the health and function of many older adults in recent decades (Adler & Snibbe, 2003; House et al., 2005; Lee, Paultre, & Mosca, 2005).

Intuitively, it seems that educational level would be associated with the development of factors associated with resilience in older adults because many of the protective factors associated with resilience can be developed and cultivated in academic settings (Jacelon, 1997; Tusaie & Dyer, 2004). However, only one of the three studies (Karoly & Ruehlman, 2006) that examined this relationship in older adults found this to be true (see Appendix A-Table A11). It is important to note this study differed from the other two in the fact that it included persons living with pain and younger than 65 years of age. This, along with evidence of moderately high levels of resilience in a sample with a high level of education (Wagnild & Young, 1993) and a linear increase of number of persons with high school education with increasing levels of resilience (Hardy et al., 2004) does suggest a positive relationship between resilience and educational level in older adults.

Income. Income can influence access to health care and one's ability to participate in health-promoting activities that contribute to healthy aging and development of psychosocial factors associated with resilience (Drewnowski et al., 2003). There is no substantial evidence that income is related to resilience but one study did report a linear trend regarding income across the three levels of resilience (low, intermediate, and high), with the largest number of persons with income greater than $25,000 in the high resilience group (Hardy et al., 2004).

Failure to detect significant associations between income and resilience in older adults may be influenced by the fact that older adults are retired and income levels do not accurately reflect long-term socioeconomic status in this population (Melzer et al., 2001). Although there is very little substantial evidence of a relationship, income is associated with other factors that contribute to health and quality of life (Wagnild, 2003) and is an important sociodemographic variable to include in this study.

Tangible social support. Positive social support can influence physical health by improving mental health and mood (Finfgeld-Connett, 2005) as well as facilitate healthy behaviors that contribute to improved health (Neugebauer & Katz, 2004; Uchino, 2006). Social support is theoretically linked with resilience because it is also believed to buffer the effect of stress on a person. For example, Turner-Cobb et al (2000) found that measures of tangible support, appraisal and belonging were inversely related to salivary cortisol levels in women with metastatic breast cancer. As noted earlier, social support is most commonly conceptualized as structural (social network and frequency of interactions) and functional (emotional and instrumental support) and the relationship between health and social support varies based on the dimension of support (Travis, Lyness, Shields, King, & Cox, 2004). Tangible social support involves helping a person perform instrumental activities such as daily tasks, transportation, or meal preparation which is important to persons who have difficulties with pain or perceived mobility. The relationship between tangible social support and resilience is less clear. Hardy et al (2004) examined resilience in community dwelling older adults and did not find a statistically significant difference in social support among participants grouped in low, medium and high levels of resilience, but the largest number of persons with high social support were in the high resilience group. In a study of older adults with osteoarthritis (N = 81), social support characterized as social activity and support from family/friends made a small contribution to the variance in physical and psychological function (Kee, 2003). The relationship between tangible social support and resilience in older adults living with FM is not known and will be explored in this study.

Health-related variables and resilience. This section of the review will explore the literature regarding the relationships between selected health-related variables and resilience.

Comorbidity. Nearly 65% of older adults live with comorbidity—multiple chronic conditions (Wolff et al., 2002). This high prevalence of comorbidity is particularly troubling because of the potentially synergistic effect a combination of diseases can have on the overall health and physical function of an older adult, raising the risk of disability and health care utilization (Guralnik, 1996). Despite the high prevalence of comorbidity in older adults and its implications for health and well-being, the relationship between resilience and comorbidity in this population has not been adequately explored (See Appendix A-Table A14). Only one study of community–dwelling older adults (N = 4602) examined this relationship and found a significant inverse relationship between chronic disease and resilience (Talsma, 1995). Further study of this relationship is warranted.

Depressive symptoms. Studies in the general population have revealed a moderately strong correlation between resilience and depressive symptoms. The authors of the Resilience Scale administered the tool to community-dwelling older adults (N = 810) with an average age of 71.1 years (SD = 6.5 yr) and found a moderate correlation between resilience and depression as measured with the Beck Depression Inventory (r = .41, p < .001) (Wagnild & Young, 1993). In a cross-sectional study of resilience in community-dwelling older persons (N = 546), Hardy et al (2004) found statistically significant differences in the number of persons with few depressive symptoms (< 16 on the CES-D scale) when they were grouped into low, intermediate and high levels of resilience, using the resilience module of the Asset and Health Dynamics (AHEAD) study. The group with high levels of resilience had more people with few depressive symptoms than the other groups. In bivariate analyses, a rating of few depressive symptoms was independently associated with high resilience (*RR* = 1.93, CI 95%, 1.37 – 2.72). In a study designed to explore relationships between life satisfaction, mental disorders and aging and also identify the impact of resilience and other resources on life satisfaction, researchers examined resilience (using the shortened Resilience Scale) and depression in a stratified random sample of German women (N = 2540). Depression was highest in the oldest group (>70 yr) and resilience was a statistically significant predictor of depression in the entire sample (β = -0.07, p < .01).

There is also evidence of a relationship between resilience and depression in persons living with pain. Sinclair and Wallston (2004) examined resilience in persons with RA (n = 140) and found a statistically significant negative correlation between depressive symptoms and resilience (r = -.30, p < .001). In a study designed to assess the psychometric properties of the Brief Resilience Scale, Smith et al., (2008) also found moderately strong correlations between depression and resilience (r = .41 to -.66, p < .01) in the four groups being studied (N = 354). The strongest correlation was found in the group of 50 that included some women with FM (n = 20). Given this evidence, it is appropriate to explore the relationship between resilience and depression in community dwelling older adults living with FM.

Body mass index (BMI). Body mass index (BMI) is another important indicator of health in older adults. While it is well established that excess weight and obesity raise the risk of mortality in younger persons, both extremes of weight (underweight and obesity) are associated with an increased risk of mortality in older adults (Corrada et al., 2006; Inoue et al., 2006; Newman et al., 2001; Stevens et al., 1998). The risk associated with underweight is due to the fact that aging is associated with significant changes in body composition that result in decreased fat free mass (muscle), increased adiposity (fat mass relative to lean mass), and decreased bone density (Villareal et al., 2005). These changes, especially when combined with chronic disease, poor nutrition, and/or physical inactivity, can contribute chronic energy imbalance and the development of frailty (Newman et al., 2001). As in younger persons, obesity in older adults is also associated with higher morbidity and mortality (Villareal et al., 2005).

To this author's knowledge, there is no research exploring the relationship between resilience and BMI. Because BMI is an important indicator of health in older adults it is reasonable to include this variable in the exploration of health-related correlates of resilience.

Physical activity. The benefits of physical activity for all ages, especially older adults, are well documented (NIH Consensus Development Panel on Physical Activity and Cardiovascular Health, 1996; U. S. Department of Health and Human Services, 1996). Because levels of physical activity tend to decrease with age, there is increased interest in identifying psychosocial factors that could influence an older adult's ability or desire to engage in physical activity (Kaplan, Newsom, McFarland, & Lu, 2001; Robbins et al., 2001). However, only two studies have actually examined the relationship between resilience and physical activity (See Appendix A-Table A16). Hardy et al. (2004) found no statistically significant relationship between resilience and levels of physical activity in their study of community-dwelling older adults (*N* = 546) but did report that the high resilience group had the largest number of persons engaging in high levels of physical activity. Talsma (1995) found that resilience was positively associated with physical activities and aerobic exercise in her sample of community-dwelling older adults living in the Netherlands (*N* = 4602).

Although the evidence regarding a relationship between physical activity and resilience in older adults is limited, there is also evidence that personality characteristics theoretically associated with resilience such as self-efficacy (Rutter, 1985), self-motivation (Rutter, 1985), low levels of depression (Bowen et al., 2003; Hardy et al., 2004; Wagnild & Young, 1993) are also correlated with physical activity levels of older adults (Kaplan et al., 2001; McAuley & Blissmer, 2000; McAuley et al., 2006). These conceptual associations suggest that resilience may also be associated with physical activity. Further research of this relationship is warranted to determine if resilience is also associated with physical activity.

Physical function. Subjective health is associated with both physical function (Guralnik, Ferrucci, Simonsick, Salive, & Wallace, 1995; Jette, 2006; Nagi, 1991; Reuben, Rubenstein, Hirsch, & Hays, 1992; Verbrugge & Jette, 1994; Wilson & Cleary, 1995) and resilience (Bowen et al., 2003; Hardy et al., 2004; Montross et al., 2006; Wagnild, 2003; Wagnild & Young, 1993), but very little is known about the relationship between resilience and physical function. Only two studies have explored the relationship between the dimensions of physical function and resilience in community-dwelling older adults with conflicting results (See Appendix A-Table A17). Nygren et al. (2005) found very little correlation between the scores on the Resilience Scale and the Physical Component Summary (PCS) of the SF-36 Health Survey (r = 0.08). It may be that the combination of pain, health and physical role activities with physical function measures in the PCS, made it difficult to detect a significant relationship in persons with advanced age and higher prevalence of pain and other physical health problems. On the other hand, Hardy et al. (2004) found that persons with high grip strength and participation in activities were more resilient. In a related study (Berkman et al., 1993), researchers did not study resilience specifically but examined factors conceptually linked to resilience (self-efficacy, mastery, life satisfaction) and subjective health, and found these were associated with higher levels of physical function (see Appendix-Table 8).

Although research exploring the relationship between resilience and physical function in older adults has been limited by a lack of consistent definition and measurement of these concepts, there is evidence that attributes of resilience are associated with higher levels of functioning in older adults. These findings, coupled with the evidence that both resilience and physical function are associated with subjective health in older adults, encourage further exploration of a possible relationship between resilience and physical function. It is especially important to use measures of resilience and physical function that are valid and reliable when used with older adult populations.

Pain. Pain and resilience in older adults are both associated with general health and psychological factors like depression, self-efficacy, and coping (Bowen et al., 2003; Gagliese & Melzack, 1997; Hardy et al., 2004; Reid, Williams, & Gill, 2003; Wagnild & Young, 1993) and it is quite likely that there may also be a relationship between these two variables. The complex nature of pain and resilience, however, makes exploration of this relationship very difficult. Three studies were identified that explored the relationship between pain and resilience in older adults (See Appendix A-Table A18).

Karoly and Ruehlman (Karoly & Ruehlman, 2006) examined psychological correlates of resilience in persons living with chronic pain (n = 544). Resilient and non-resilient subsamples were drawn from a larger sample of individuals living with chronic pain (N = 2407). Participants whose responses to the Profile of Chronic Pain: Screen revealed a pattern of high severity and low impact were placed into the resilient group (n = 272). An age- and gender-matched group of persons whose responses revealed high severity and high impact were placed in the non-resilient group (n = 272). Mean age was not reported, but 35% of the persons in each group were over 65 years of age. There was only one demographic difference between the groups—the resilient group had more education ($p < 0.01$). The findings support the assertion that resilience protects psychological function—the resilient group reported fewer negative pain behaviors (guarding, fear, catastrophizing, belief in cure, disability) and more positive behaviors (self-talk, task persistence, successful coping) than the non-resilient group. The study was limited by the cross-sectional design and lack of a valid, reliable measure of resilience. Despite these limitations, the process used to identify resilient persons living with pain supports this proposal to examine factors that moderate the impact of pain on physical function. The authors noted that 13% of the larger sample of persons with chronic pain were identified as resilient. It is important to examine the factors that contribute to this variation.

Sinclair and Watson (2004) examined the reliability and validity of the Brief Resilient Coping Scale (BRCS) by administering it to two groups of persons living with rheumatoid arthritis (RA). They found that resilient coping was associated with measures of personal coping resources, coping behaviors, and psychological well-being; it further moderated the impact of pain and stress on depressive symptomotology (Sinclair & Wallston, 2004). In persons who had high levels of pain or stress and high levels of resilient coping, the degree of depressive symptomotology was much less than for those with low levels of resilient coping.

Wright and colleagues (2008) examined the influence of resilience factors (positive affect, extroversion, vitality) on pain and physical function in persons participating in a study of early knee osteoarthritis. The sample (N = 204) was restricted to persons between the ages of 35 and 64 years, but was included in this review because it was the only one identified that specifically explored the relationship between resilience and physical function. They found that resilience indirectly influenced pain and physical function through self-efficacy, that resilience was highly correlated with self-efficacy, and that self-efficacy mediated the relationship between resilience and physical function. Persons with high levels of resilience had high levels of self-efficacy and better functioning. Although there were no persons over 65 years of age in the study, the researchers observed that age was an important variable to consider. Older participants reported greater difficulty with physical function but lower levels of psychological risk (depressive symptoms, neuroticism, negative affect) which is consistent with patterns observed in older adults in other studies (Burckhardt et al., 2001; Cronan et al., 2002). This study was also limited by the cross-sectional design as well as the exclusions of persons over 65 years of age and those who had high levels of physical activity. Despite the limitations, it is encouraging to see a study that examines both risk and resilience in persons living with a painful condition like OA. The findings from these studies support the proposed research exploring the relationships between FM pain, physical function, and resilience in older adults.

Moderating Variables

Although the frequency of pain in FM is high and the impact of pain tends to increase with age in the general population (Thomas et al., 2006), there are many older adults with FM who function better than their younger counterparts despite the presence of pain (Burckhardt et al., 2001; Cronan et al., 2002; Yunus et al., 1988). When the relationship between a predictor (pain) and outcome variable (physical function) is weak or inconsistent, it is possible that there are other factors that can moderate or influence this relationship (Bennett, 2000). Factors that can reduce demand or increase capacity for physical function are examples of variables that can theoretically moderate relationships between predictors and outcomes. Verbrugge and Jette (1994) also theorized that intra-individual and extra-individual interventions could moderate the relationships between the elements of the Disablement Process.

Moderating relationships differ from mediating relationships in several important ways. Moderating variables are those that can influence the strength or direction of the predictor-outcome relationship. In other words, the relationship between the predictor and outcome variables is affected by the level of the moderator (Baron & Kenny, 1986; Bennett, 2000; Rose, Holmbeck, Coakley, & Franks, 2004). Moderators describe the conditions under which the predictor influences the outcome. Mediating relationships are associated with causal models and explain why a relationship between a predictor and outcome occurs (Rose et al., 2004). Mediating relationships are explored among established predictors of an outcome to determine if there are causal associations among the predictors. Predictors with evidence of mediating relationships are displayed in the Disablement Process (Verbrugge & Jette, 1994).

Pain is an impairment that is identified in the model as a predictor of functional limitations that can lead to disability. Because there is no evidence that resilience predicts physical function, resilience (intra-individual factor) will be examined as a moderator in this study to determine if the impact of pain on physical function is moderated by resilience. If resilience is a moderator, the impact of pain on physical function will vary based on the level of resilience. For example, if resilience is a moderator, persons with high pain levels and high levels of resilience will experience less functional impact from the pain than those with low levels of resilience. Evidence supporting the rationale for examining resilience as a moderator of the relationship between pain and physical function will now be reviewed. Studies discussed in this portion of the review are displayed in the Appendix (Tables A8 and A19).

Resilience as a moderator of pain and physical function. Despite the increased incidence and prevalence of pain-related interference with daily life associated with age, not all older adults who experience pain also have difficulty with physical function. The presence of pain increases the risk of difficulties, but the relationship between pain and physical function is not linear. Although the correlation between pain and physical function appears to increase with age in the general population, there is considerable variation in the strength of this relationship and many continue to function despite the presence of pain. For example, Scudds and Ostbye (2001) found that, while pain-related interference with moving increased with age, 35% of the oldest group (90+ years) reported no interference, as did 46% of those 70 to 79 years of age. It is also interesting to note that 31% of the persons reporting no pain-related interference in this study also reported their pain intensity as moderate/severe/very severe. This suggests that the relationship between pain and physical function may not be as strong as one would expect. The pain associated with FM also appears to have less impact on older adults than it does in younger people (Burckhardt et al., 2001; Cronan et al., 2002; Yunus et al., 1988).

The question remains: what are the protective factors that can influence or moderate the relationship between FM pain and physical function? The biopsychosocial model of pain suggests that the pain response is influenced by interactions between biological, psychological and sociocultural variables. Psychosocial variables, in particular, appear to be more predictive of physical function in younger persons living with chronic pain than physical factors like pathology (injury severity) or environmental demands (Turk & Okifuji, 2002).

Resilience is a psychosocial variable that could potentially influence the effect of pain on physical function. Unfortunately, the body of research exploring resilience as a moderator of pain and physical function is even more limited than that exploring resilience in older adults. No articles were identified that explored resilience as a moderator of the effect of pain on any of the dimensions of physical function. However, one article was retrieved that examined the influence of resilience on the relationship between pain and depression, which is associated with resilience. As mentioned earlier, Sinclair and Wallston (2004) tested the validity and reliability of a newly developed 4 item resilience coping scale in women with rheumatoid arthritis and found a significant interaction effect of pain and resilient coping on depression scores (See Appendix A-Table 16). Individuals with high pain levels and high resilience coping scores had significantly lower depression scores than those with high pain levels and low resilient coping scores. Unfortunately, this measure does not capture the full range of resilience as conceptualized in the proposed study, but these findings support further exploration of resilience as a moderator of physical function.

Although there is very little evidence that resilience moderates the relationship between pain and physical function, there is evidence that variables theoretically linked with resilience are directly and indirectly linked to both pain (Turk & Okifuji, 2002) and the dimensions of physical function (Kempen et al., 2006; Kempen et al., 1999; Wright et al., 2008). For example, Rejeski et al. (2001) explored relationships between self-efficacy beliefs for functional tasks and function over a 30-month period in community-dwelling persons 65 years of age and older ($N = 480$). They found that all had knee pain which correlated with self-reported IADLs ($r = 0.37$, $p < .001$) and stair climbing ($r = 0.32$, $p < .001$). Good function had the strongest relationships with good knee strength or high self-efficacy. They also reported an interaction between self-efficacy and knee strength. Baseline levels of self-efficacy were important predictors of functional decline at the end of the study in persons who had poor baseline knee strength. In other words, self-efficacy was most important to those who were challenged (poor baseline knee strength). Potential interactions between pain and self-efficacy were not examined but the reported interaction between self-efficacy and knee strength, a measure of physical fitness that is also a predictor of physical function (physical fitness is the positive term for impairment in the disablement process), invites further study of interactions between resilience and other predictors, like pain.

Despite the high prevalence and growing incidence of pain interference with daily life in older populations, there is a significant gap in the research exploring resilience as a potential factor that can moderate the relationship between FM pain and physical function in older adults.

Summary

This review of the literature has provided evidence regarding the conceptualization of the key variables that will be explored in this study and what is known about FM, physical function, and resilience in older adults. FM pain poses a significant threat to older adults (Burckhardt et al., 2001; Cronan et al., 2002; McBeth & Jones, 2007; Shillam, 2008; White et al., 1999a; Yunus et al., 1988) and pain is associated with difficulties in physical function (Scudds & Ostbye, 2001; Thomas et al., 2006; Thomas et al., 2004). Despite this association, many older adults with FM are able to function in the presence of pain but little is known about factors that might explain this. Pain is a perceptual process that involves the integration of sensory, motivational, and cognitive factors (Melzack & Wall, 1965). Cognitive factors, such as self-efficacy, and strategies such as cognitive re-structuring can influence the pain experience and action taken as a result of the pain perception (Arnstein, 2002). Since resilience reflects a person's underlying pattern of interaction with stressors and has been associated with psychological attributes like self-efficacy, mastery, and cognitive appraisal, it is possible that a person's level of resilience may influence physical function in the presence of FM pain.

Physical function is an important predictor of changes in a person's ability to participate in meaningful life activities (e.g., disability) that can significantly influence the experience of health and quality of life (Bennett et al., 2006; Seeman et al., 1999). Self-reported physical function is an especially important health outcome to study in older adults because it reveals an older adult's personal assessment of his/her ability to perform physical actions that support overall physical function (Sayers et al., 2004). The disablement process has provided an important foundation for the study of physical function in older adults because it identified distinct elements that could lead to the development of disability and informed the development of disability research. We now know that the transition from ability to disability and back is a common experience for many older adults (Gill et al., 2006) and contemporary models of the disablement process support a multidimensional approach that encourages research in the dynamic relationships between all of the variables that can affect a person's ability to move and engage in meaningful activity. It is important that research with conceptual models of physical function explore factors that not only decrease the risk of disability but also protect physical function in older adults (Kempen et al., 2006). The Disablement Process (Verbrugge & Jette, 1994) provides that framework. The review of the literature has supported the choice of theorized predictors of physical function that will be examined in this study. Predictors that have a negative effect on physical function include advanced age, female gender, low levels of income and education, low levels of tangible social support, high comorbidity, extremes of body mass index, physical inactivity and the presence of depressive symptoms.

The review of resilience literature revealed a significant gap in knowledge about resilience and its relationship to FM pain and physical function in older adults. Resilience has not been extensively studied in older adults, but there is evidence that it is associated with measures of healthy aging (e.g., subjective health, low levels of depression). FM pain, physical function, and its predictors are also theoretically linked with these measures of healthy aging and recent psychobiological research supports this assertion (Feder, Nestler, & Charney, 2009). The shared association with measures of healthy aging invites further exploration of these relationships.

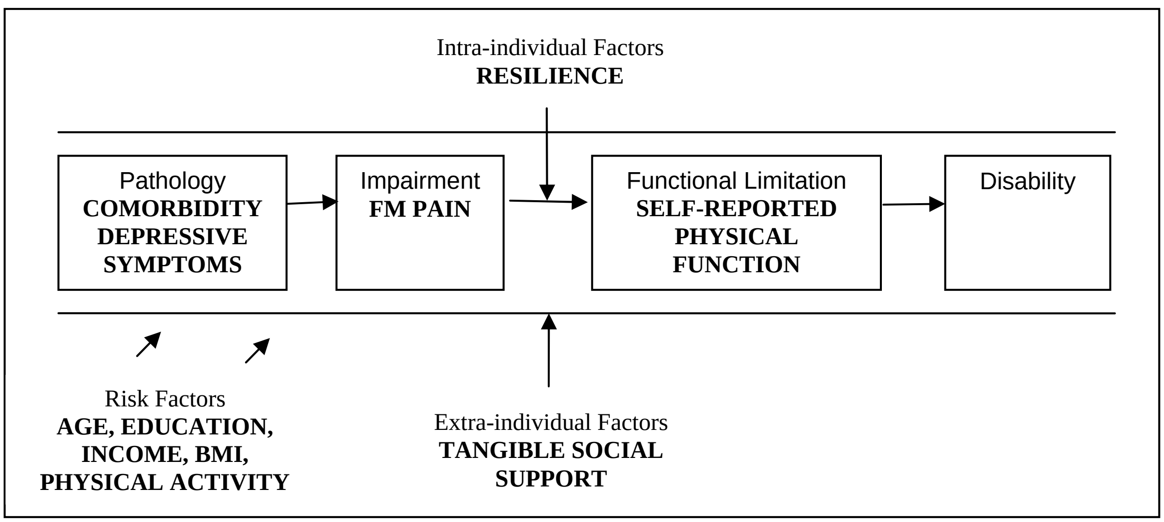
Based on the findings in this review of the literature, the purpose of this study is to explore FM, physical function, and resilience in older adults as well as to examine the influence resilience might have on the relationship between FM pain and physical function. Doing so will enhance our ability as nurses to recognize resilience as well as vulnerability and to plan interventions that promote health in a growing number of community-dwelling older adults living with FM.

Conceptual Model

The purpose of this study is to explore the relationships between pain, physical function, and resilience in community-dwelling older adults living with FM and to examine the influence of resilience on the relationship between FM pain and self-reported physical function.

The conceptual model guiding the proposed study was an adaptation of The Disablement Process (Verbrugge & Jette, 1994). Figure 3 displays the relationships between the variables that were examined in this study (bolded in capital letters). The elements within the disablement process explored in this study included comorbidity and depressive symptoms (pathology), pain(impairment) and self-reported physical function (functional limitation). Risk factors—lifestyle behaviours, age, gender and other pre-existing conditions that can influence the disablement process—included age, education, income, BMI, and physical activity. Tangible social support was conceptualized as an extra-individual factor and resilience was conceptualized as an intra-individual factor. Resilience was also examined as a moderator of the relationship between pain and self-reported physical function.

Figure 3. Conceptual Model (adapted from Verbrugge & Jette, 1994)



Relationships between the variables were examined along with the hypothesis that resilience moderated the relationship between FM pain and self-reported physical function. A variable is considered a moderator if the effect of one variable on another depends on the level of the moderator. It was hypothesized that the negative effect of high pain level on self-reported physical function would be less in persons with high levels of resilience than in persons with low levels of resilience.

Assumptions of the study. There are several assumptions in this study. They are:

1. Participants reflect characteristics of community-dwelling older adults living with FM.
2. Participants have the cognitive ability to evaluate their physical function, pain level, and resilience.
3. Self-reported physical function reflects a person's assessment of personal capacity for physical function and is associated with objective measures of physical function.

Definition of Terms. Self-reported physical function is defined as self-reported difficulty in completing specific actions or activities that are part of daily routines and require gross or fine motor operations (Haley et al., 2002; Jette, Haley, Coster et al., 2002).

FM pain is defined as an unpleasant sensory and emotional experience associated with FM. Pain is a complex and highly personal experience that can only be identified and reported by the person experiencing the pain (McCaffery & Pasero, 1999).

Resilience is defined as "a personality characteristic that moderates the negative effects of stress and promotes adaptation" (Wagnild & Young, 1993, p. 165).

Comorbidity is defined as co-existing chronic conditions that can impair function and raise the risk of mortality (Di Bari et al., 2006).

Depressive symptoms are affective, cognitive, and physical signs and symptoms associated with depression (NIH Consensus Development Panel on Depression in Late Life, 1992).

Body mass index (BMI) is defined as an index that describes relative weight for height and is used to assess underweight, normal, overweight, and obesity in older adults (U. S. Department of Health and Human Services, 1998).

Physical activity is defined as “any bodily movement produced by skeletal muscles that results in energy expenditure” (Caspersen, Powell, & Christenson, 1985).

Tangible social support is defined as assistance with instrumental activities of daily living such as daily tasks, transportation, or meal preparation (Sherbourne & Stewart, 1991)

Community-dwelling older adult living with FM pain is defined as a person over the age of 50 who is not a resident of a nursing facility and has been diagnosed with FM by a health care provider using 1990 ACR criteria.

Chapter 3: Research Design and Methods

Design Overview

The study utilized a descriptive correlational, cross-sectional design to explore demographic variables (age, education, income, tangible social support) and health-related measures (FM Impact, comorbidity, depressive symptoms, BMI, physical activity, self-reported physical function, pain, and resilience) in a sample of adults with FM. The influence of resilience on the relationship between FM pain and self-reported physical function was also examined.

Setting and sample

The target population was community-dwelling older adults with FM over 50 years of age who were members of an OHSU patient database. The database consists of approximately 1,300 persons classified with FM (ICD-9 729.1) per 1990 ACR criteria by OHSU FM clinic staff who have indicated interest in participating in FM studies. Postal addresses in this database are updated frequently due to twelve to fourteen mailings sent to subjects each year querying their interest in FM research studies and FM patient education meetings.

A convenience sample of 224 persons meeting the following inclusion criteria were enrolled in the study: a) 50 years of age or older; b) diagnosis of FM based on the 1990 American College of Rheumatology classification criteria; c) able to speak, read and write English and d) previous participation in OHSU FM studies (within the past two years). An age of 50 years was selected as the lower limit to be consistent with other studies that have included persons 55 and over in older age groups (Burckhardt et al., 2001; Cronan et al., 2002; Gowin, 2000; Shillam, 2008; White et al., 1999b; Yunus et al., 1988). This lower limit was supported by evidence that FM often begins in the third and fourth decade of life and can impact physical function of younger persons in the same way age-related changes impact physical function in healthy older groups (Jones et al., 2008).

Power analysis

Power analyses of the second and third aims were conducted to determine the minimum effect size for each analysis that would be detected with a sample of 200 subjects at 80% power and .05 level for statistical significance. The power analysis for the second aim which required multiple regression with 8 predictor variables revealed adequate power to detect an effect size as small as $R^2 = 0.07$ due to the combined effect of the predictor variables (computed using nQuery Advisor, Statistical Solutions, Saugus, MA). The analysis for the third aim required hierarchical multiple regression with 11 variables. Power analysis for this aim revealed adequate power to detect R^2 of at least 0.08 due to the interaction variable (pain x resilience) after accounting for significant covariates identified in the second aim and the main effects of pain and resilience. The analysis revealed adequate power to detect very small effect sizes in this study (C. Asp, personal communication, June 23, 2009).

Protection of human subjects

Approval of the proposed study by the Institutional Review Board, Oregon Health & Science University, was obtained prior to conducting the study. Study materials reviewed by the OHSU Institutional Review Board included the Questionnaire, Information Sheet, Invitation to Participate, script for initial phone call, script for follow up recruitment phone call, script for follow up clarification phone call, and script for administering the questionnaire over the phone. Consent to participate was indicated by returning the completed written questionnaire or obtained verbally prior to completing the telephone version. The information form sent to each participant provided information about the study, procedures for protecting participant identity and data, and the benefits and risks associated with participating in the study. The information form clearly stated that participation in this research was voluntary and would not affect their ongoing care at OHSU.

Adverse events were not expected in this study, which consists solely of mailed surveys. It was possible that participants could become fatigued while completing the surveys but since they were completed at the participant's home, they had the option of stopping and resting at any point.

There was minimal risk of loss of confidentiality because confidentiality of participant data was strictly observed. All questionnaires and data files were identified by a study participant code number only. The master list of names linked with participant code numbers was stored separately in a password-protected computer file and the paper copy of the first page of the survey was filed in a locked cabinet. Only authorized study personnel had access to these documents.

Procedures

Previous experience with the OHSU FM patient database has yielded response rates ranging from 30% to 72%, which are slightly higher than the typical mailed survey response rate (Jones, Burckhardt, Clark, Bennett, & Potempa, 2002; Pedhazur & Schmelkin, 1991; Shillam, 2008). A conservative response rate of 50% was used to determine the number of persons that would be invited to participate in this study. The

400 potential participants were drawn from the OHSU FM patient database. Limits were set on the database to extract the names and contact information of persons fifty years of age and older who have participated in FM studies in the last 2 years. Currently only 300 of the persons in the database have verified birth date information, so persons with a recent diagnosis of FM were also removed, since most older adults who have FM have had it for several years. Those extracted were placed into an excel spreadsheet and sorted into 5 age groups (50-54, 55-59, 60-64, 65-69, 70 and over). In an attempt to enhance representation from each age group, at least 80 persons were selected from each age group who were contacted and invited to participate in the study. Persons who were 50-69 years of age were selected randomly from their particular age group. Questionnaires were sent to all persons who were 70 years of age and older (n = 83). Participants were initially contacted by phone to invite participation and, if willing to participate, birthdate and contact information were both verified. If it was not possible to talk with the person, a message was left indicating that a questionnaire would be sent along with the name of the researcher and a toll-free number they could call if they had questions. Persons with disconnected phone numbers were removed from the list. Potential participants were contacted until 400 questionnaires had been sent.

A packet of materials containing an invitation letter, an information sheet, a questionnaire, a two dollar bill and a stamped self-addressed envelope were sent to the potential subjects. The invitation letter and information sheet briefly explained the purpose of the study, procedure, benefits and risks associated with the study. Those willing to participate completed the questionnaire and returned it in the stamped return-mailing envelope. Consent to participate was acknowledged by return of the questionnaire. The questionnaire took approximately 30 minutes to complete. A two dollar bill was included with the mailing as a token of gratitude for the subject's participation and contribution to this research.

Each survey returned to the study office was keyed with a unique code number assigned to the participant. Each survey was also reviewed for missing data at that time. Persons who returned questionnaires with missing or unclear responses were called one time by the investigator in an attempt to review the items with them to retrieve the missing data.

If subjects did not return the questionnaires, the principal investigator made a single reminder phone call approximately 4 weeks after the initial mailing. The subject was asked if s/he had any questions or concerns about the questionnaire and participation in the study was encouraged. The option of completing the questionnaire over the phone was also offered during the initial recruitment call and follow up phone call to enhance response rate. If the person agreed to a phone interview, the information sheet was reviewed and verbal consent was obtained prior to initiating the questionnaire. Two of the participants were interviewed by phone (0.8%). Data collection continued until 200 surveys were returned.

Measures

Demographic variables. Demographic information was collected via an investigator-developed questionnaire that included questions about age, gender ethnicity, race, marital status, social support, education and income. Demographic variables examined in this study were age, education, and income. Age was calculated from the reported birth date year and gender was reported as either male or female. Ethnicity was categorized as either Hispanic or non-Hispanic. Race choices included American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, or White. Highest education completed was reported as one of seven categories (less than high school, high school graduate/GED, associate/technical degree, college but no degree, bachelor's degree, advanced degree, other). Annual household income was selected from the following levels: less than $20,000; $20,000-29,000; $30,000-39,000; $40,000-49,000; $50,000-75,000; $75,000 +. Current marital status was identified as one of six categories (never married, married, separated, living together as married, divorced, and widowed).

Tangible social support. Tangible social support was operationalized using the Medical Outcome Studies Social Support Survey (MOS-SS)—Tangible Social Support Scale. The MOS-SS is a multidimensional social support survey designed to assess the functional aspects of social support (Sherbourne & Stewart, 1991). Creators of the tool generated items from existing social support measures and selected those that were conceptually linked to functional support to create the survey. Each of the 20 items in MOS-SS is rated on a 5-point Likert scale to indicate availability of support (1 = *none of the time*, 5 = *all of the time*). Nineteen of the items can be divided into 4 subscales that measure perceived adequacy of four dimensions of social support: 1) tangible support; 2) information and emotional support; 3) positive social interaction; and 4) affectionate support. The tangible social support score is computed from the responses to the perceived availability of support in 4 situations: 1) someone to help if you were confined to bed, 2) someone to take you to the doctor if you needed it, 3) someone to prepare meals if you were unable to do it by yourself, and 4) someone to help with daily chores if you were sick. To obtain scores for this and the other subscales, the average of the scores from each item from the subscale is calculated. Subscale and overall support scores can also be transformed to a 0 – 100 scale to compare scores to published means. Higher scores indicate greater levels of support.

Psychometric evaluation of the MOS-SS conducted by the developers provided evidence of internal consistency and test-retest reliability. Cronbach's alpha for the entire tool was .97 and for the tangible support scale was .92 (Sherbourne & Stewart, 1991). Test-retest after one year revealed a correlation of .78. Westaway et al. (2005) examined the MOS-SS and subscales in study of African American adult diabetics and reported Cronbach's alpha for the overall tool as .97 and .95 for the tangible support subscale. Reliability testing of a Chinese version revealed similar measures of internal consistency (Cronbach's alpha for entire tool was .98, tangible support subscale was .93)

There is also evidence of content validity for the overall tool, as well as the tangible support subscale. The developers reported moderate statistically significant correlations ($p < .01$) between the MOS-SS and measures of loneliness (r = -.67), family functioning (r = .53), marital functioning (r = .56) and mental health (r = .45). Correlations between the tangible support scale and these measures were also statistically significant: loneliness (r = -.53), family functioning (r = .38), marital functioning (r = .44) and mental health (r = .36). Confirmatory factor analysis supported the four-factor structure of the tool. Tangible support item factor loadings ranged from .76 to .93 (Sherbourne & Stewart, 1991).

Self-reported physical function. Self-reported physical function was measured using the Function Component of the Late Life Function and Disability Index (LLFDI)

(See Appendix B). The LLFDI was developed to assess the functional limitation and disability stages of the Disablement Process and to allow more accurate testing of predictive relationships between the dimensions of physical function (Jette, 2003; Jette, Haley, & Kooyoomjian, 2002). The instrument is appropriate for use with community dwelling older adults because it assesses a broad range of activities associated with independent living making it less affected by ceiling effects typical of other standardized measures with a more limited range of activity and more sensitive to physical function changes in community dwelling older adults (Haley et al., 2002). The instrument consists of two components that measure function as well as disability. The function component measures an older adult's "ability to perform discrete actions or activities as part of daily routines" and corresponds to the functional limitation phase of the pathway (Jette, Haley, & Kooyoomjian, 2002, p.6). The disability component assesses an older adult's performance of "socially-defined life tasks" and corresponds to the disability phase of the pathway (Jette, Haley, & Kooyoomjian, 2002, p.6). Since this study was focused on self-reported physical function, which corresponds to functional limitations measured by the function component, the disability portion of the LLFDI was not used.

The LLFDI function component contains 32 items that describe activities ranging from self-care to domestic activities and involve a variety of movements that require lower and upper extremity function (carrying, moving, walking, changing position) (Jette, Haley, & Kooyoomjian, 2002). Participants rate how difficult they think it would be to do an activity without help or equipment on a 5-point scale ranging from 1 (*cannot do*) to 5 (*no difficulty*). Raw scores from each item response are transformed to scores that range from 0-100 for the total function scale as well as each of the subscales (advanced lower extremity function, basic lower extremity function, and upper extremity function). Higher scores indicate better function.

The LLFDI —function component is a relatively new measure of physical function in older adults, but there is evidence regarding the reliability and validity of this instrument when used with community-dwelling populations (Dubuc, Haley, Ni, Kooyoomjian, & Jette, 2004; Haley et al., 2002; McAuley, Konopack, Motl, Rosengren, & Morris, 2005; Ouellette et al., 2004; Sayers et al., 2004). Initial field testing of the function component in a sample of community-dwelling older adults (N = 150) revealed test-retest reliability coefficients of the scale and subscales, administered to a subset (n = 15) one to three weeks after the initial administration, were very high (ICC = .91 - .98, p's <.001). In this sample, the scale yielded Cronbach's α = .96. The scores on the instrument also significantly differed between four levels of limitation categorized by the SF-36 Physical Function scale (severe, moderate, slight, and none) and differed between pairs of groupings (severe to moderate, moderate to slight, slight to none) on all of the scale scores (total function, advanced lower extremity, basic lower extremity, upper extremity).

There is also evidence of concurrent validity with objective and subjective measures of physical function. Sayers et al. (2004) reported that 400-meter walk scores were significantly correlated with overall function (r = 0.66, p <.001), basic lower extremity function (r = 0.65, p <.001) and advanced lower extremity function (r = 0.73, p <.001) in a study of community-dwelling older adults (N = 101) ranging in age from 76 to 90 years. Short Physical Performance Battery summary scores were also significantly correlated with overall function (r = 0.65, p <.001), basic lower extremity function (r =

0.63, p <.001) and advanced lower extremity function (r = 0.67, p <.001). Dubuc et al. (2004) also found the function component to be highly correlated with the Short-Form-36 physical function (PF-10) (r = 0.85) when used with a sample of community-dwelling older adults (N = 75).

There are fewer problems with ceiling and floor effects with the LLFDI when compared to the PF-10. During initial field testing of the LLFDI-function component in a sample of community dwelling older adults (N = 50), only one person achieved a maximum score, whereas 14% of the sample achieved the maximum score on the PF-10 (Haley et al., 2002). Duboc et al. (2004) also reported a significant ceiling effect with the PF-10 (16%) that was not the case with the LLFDI.

The LLFDI has not been used extensively in FM populations because FM has been studied primarily in younger age groups. One researcher is known to have examined the relationships between FM symptoms and self-reported physical function using the LLFDI in persons 55 to 76 years of age (Shillam, 2008). Interestingly, the researcher found no significant differences in self-reported physical function between middle aged FM patients (55 to 64 years of age) and older FM patients (65 to 76 years of age). Both groups reported only moderate functional limitations from FM symptoms and there was no significant correlation between age and self-reported physical function using the LLFDI. These findings are inconsistent with other reports that FM impact on physical function worsens with age and may reflect important differences in sensitivity and specificity of the LLFDI when compared with other functional impact measures developed for younger FM populations. Further use of the LLFDI with older FM populations is warranted because it correlates well with objective measures of physical function and has sufficient evidence of reliability and validity as a comprehensive measure of self-reported physical function in community-dwelling older adults, including those who are functioning at the higher range of the scale.

FM impact. The FM Impact Questionnaire-Revised (FIQR) was used to measure the FM impact. The FIQR is a recent revision of the FM Impact Questionnaire (FIQ), a brief, self-administered, 21-item questionnaire that measures 3 linked categories of function, overall impact, and symptoms (Bennett, Friend, et al., 2009). The FIQ was revised to simplify the scoring process, address concerns about gender bias in the physical function questions, increase the weighting of physical function in the total score, and add symptoms that were identified as important to include in evaluation measures by rheumatology clinicians and FM patients (Bennett, Friend et al., 2009). The nine function items reflect 30% of the total score and assess large muscle activities of the upper and lower limbs. Twenty percent (20%) of the total score is based on the two items used to assess overall impact on 1) functional ability and, 2) the perception of reduced function. The ten symptom items comprise the remaining 50% of the total score. The symptoms assessed include pain, stiffness, lack of restorative sleep, poor energy, anxiety, depression, tenderness, memory, balance, and environmental sensitivity. The 21 items are rated on a 0-10 numeric rating scale. The function items are anchored by *no difficulty* and *very difficult* and the overall impact items with *never* and *always.* The symptom items are anchored as follows (anchors in parentheses): pain (*no pain* and *unbearable pain*), energy (*lots of energy* and *no energy*), stiffness (*no stiffness* and *severe stiffness*), sleep (*awoke well rested* and *awoke very tired*), depression (*no depression* and *very depressed*), memory problems (*good memory* and *very poor memory*), anxiety (*not* *anxious* and *very anxious*), tenderness to touch (*no tenderness* and *very tender*), balance (*no imbalance* and *severe imbalance*), and environmental sensitivity to loud noises, bright lights, odors and cold (*no sensitivity* and *extreme sensitivity*). All of the questions ask about function, overall FM impact, and FM symptoms over the past 7 days.

Scoring has been simplified in the FIQR. Scores for each of the domains are first summed and then each domain score is weighted as follows: the total function score (0 – 90) is divided by 3, the total overall impact score (0 – 20) is unadjusted, and the total symptom score (0 – 100) is divided by 2. The weighted scores for each category are then summed to calculate a total FIQR impact score. The total maximal impact score of the FIQR remains the same as the original FIQ at 100 points. Higher scores indicate greater negative impact of FM.

Initial psychometric testing of the new FIQR scale was conducted by the developers who administered online versions of the FIQR, FIQ, and SF-36 to a sample of FM patients (N = 208) (Bennett, Friend et al., 2009). The Cronbach's alpha for the FIQR was 0.95 and item-total correlations ranged from 0.56 to 0.93. In this sample, the FIQR yielded Cronbach's α = .93. Correlations between the FIQR and the SF-36 are negative because higher scores on the SF-36 indicate better function. The FIQR total score correlated best with the SF-36 physical function and pain subscales (r = -0.71 and r = -0.69, respectively). The FIQR function weighted score strongly correlated with SF-36 physical function subscale (r = -0.80), the FIQR overall impact weighted score correlated well with SF-36 physical function and pain subscales (r = -0.60 and r = -0.64, respectively) and the FIQR symptom weighted score correlated with all of the SF-36 subscales (r range from -0.43 to -0.66). The FIQR pain item correlated strongly with SF-

36 pain (*r* = -0.66). The original FIQ has accumulated significant evidence of validity and reliability through its use in over 250 studies, and the FIQR total score strongly correlated to the FIQ ($r = 0.88$, $p < .001$. The correlations between the scores on the FIQR and FIQ domains and subscales were also strong: function ($r = .69$, $p < .001$), overall impact ($r = .69$, $p < .001$), symptoms ($r = .88$, $p < .001$), and pain ($r = .75$, $p < .001$). Significant differences on the FIQR total scores between FM patients, a healthy control group, a group of persons with systemic lupus erythematosus or rheumatoid arthritis, and a group receiving treatment for major depressive disorder provided evidence of discriminant validity. The mean FIQR total score was significantly higher in the FM group than the other 3 groups ($F = 248$, *Tukey HSD test* < 0.00008). Multiple regression analysis revealed that the FIQR domains predicted the 8 SF-36 domains, supporting the domain structure of the FIQR. FIQR function predicted SF-36 physical functioning and role limitation due to physical health ($\beta = -0.803$, $p <.001$ and $\beta = -0.270$, $p < .01$), and FIQR symptoms predicted the remaining 6 domains of the SF-36 (β's ranged from -0.347 to -0.593, all significant at $p < .001$).

Pain. Pain was also examined in this study. Participants were asked in the FIQR to rate their level of pain over the last seven days on an 11 point scale (0-10) where 0 = *no pain* and 10 = *unbearable pain.* Numeric rating scales (NRS), along with visual analog scales (VAS) and verbal descriptor scales (VDS), have been used extensively to assess pain intensity when conducting a quantitative assessment of persistent pain in older adults (A. G. S. Panel on Persistent Pain in Older Persons, 2002; Gagliese & Katz, 2003). Herr, Spratt, Mobily, and Richardson (2004) examined five commonly used measures of pain intensity (21-point NRS, 11-point NRS, 6-point VDS, Faces Scale, and vertical VAS) and assessed the psychometric properties and utility of each by measuring the response to different levels of thermal stimuli administered to older (N = 89) and younger (N = 86) persons. Intercorrelations between the scales at each temperature were statistically significant and ranged from 0.78 to 0.94. The NRS correlations with the other scales ranged from 0.73 to 0.96.

Internal consistency across a set of scores was evaluated in two ways: 1) within each scale across the seven temperature values (α = 0.86- 0.88) and 2) within each temperature across all five scales (α = 0.96 — α = 0.97). Cronbach's alpha of the NRS was reported to be 0.88. Construct validity for the all of the scales was demonstrated through factor analysis. Principal component factor analysis of ratings obtained at one temperature revealed a single factor solution. The correlation between the NRS and the single factor was the highest of all of the scales (r = 0.96).

In order to evaluate sensitivity, data from the five scales were transformed and placed on the same scale (Herr et al., 2004). This part of the analysis revealed that the scores of the younger group were significantly lower than those of the older group (17.29 $\pm$ 23.23 vs. 22.34 $\pm$ 24.46, $F_{1,173} = 4.29$, $p < 0.04$). The NRS, along with the other tools, demonstrated significant differences across temperatures ($F_{6, 1024} = 56.92$, $p < 0.0001$). The authors noted that the scale most familiar to the subjects, the 0-10 VNS, was associated with the higher levels of pain reports than the other less familiar scales, but there were no significance differences between the age groups regarding pain threshold.

Although the authors found all five measures to be psychometrically sound they did not recommend using the VAS with older populations. They observed a higher failure rate in younger adults vs. older adults in both initial use (young = 3.5% vs. old =

6.7%) and repeated use (young = 14.3% vs. old = 19.1%) of the VAS (Herr et al., 2004). There were minimal failures when the other pain scales were used by both age groups (rates for each ranged from 0 to 2.2%). This recommendation supports the decision by the developers of the FIQR to use an 11-point NRS to measure pain level. According to Herr et al. (2004), the NRS was the preferred scale (35.3%) by all and there were no significant differences in the scale preferences based on age, sex, education or cognitive function. The authors noted that this was also true for persons with mild cognitive impairment, as measured by the Cognitive Capacity Screening Examination (CCSE).

The findings from this study of pain rating scales, along with the psychometric evidence of the FIQR, provide sufficient evidence that the 0-10 NRS from the FIQR is reliable and valid when used to measure pain level in older adults living with FM.

Resilience. Resilience was measured using the Resilience Scale (Wagnild & Young, 1993). The Resilience Scale has been used with older adults and other populations to examine the relationship between resilience and variables associated with health and successful aging (Appendix B). It contains 25 items created from the transcripts that reflect five themes identified in qualitative research with older women (equanimity, perseverance, self-reliance, meaningfulness, existential aloneness). The items are worded positively and rated on a 7-point scale (0 = *strongly disagree*, 7= *strongly agree*). An overall resilience score is obtained by summing the ratings. Scores can range from 25 to 175, with higher scores indicating greater resilience. The author reported that moderately high to high resilience is indicated by a score greater than 145. Moderately low to moderate levels of resilience are associated with scores from 121 to 145 while scores less than 121 indicate low resilience (Wagnild, 2009)

The Resilience Scale has not been used in FM studies, but there is substantial evidence of reliability and validity when used with older adults. Although the instrument was developed from interviews with older women, the Resilience Scale has been used in a variety of populations including adolescents, young adults, immigrants, women, and older adults (Felten & Hall, 2001; Rew, Taylor-Seehafer, Thomas, & Yockey, 2001; Wagnild, 2003). Initial psychometric testing by the authors was conducted in a random sample of community-dwelling older adults (N = 810). Internal consistency was high ($\alpha = 0.91$) and item-to-total correlations were also satisfactory ($r = 0.37$ to $r = 0.75$, $p < .001$). In this sample, similar internal consistency was obtained with Cronbach's $\alpha = .92$. Concurrent validity was supported by moderate correlations with other measures of adaptation: morale ($r = 0.28$), life satisfaction ($r = 0.30$, depression ($r = -0.37$), and somatic health ($r = -0.26$). Other researchers also reported evidence that the instrument correlated positively and significantly with constructs theoretically linked with the definition of resilience such as sense of coherence, purpose in life test, self-transcendence scale, and SF-36 physical and mental health scales (Nygren et al., 2005); life orientation test Cantrell life ladder scale, and life attitude profile-revised (Bowen et al., 2003); and life satisfaction index, Philadelphia Geriatric Morale Scale, and Health Promoting Lifestyle Profile(Wagnild, 2003).

Comorbidity. Comorbidity was measured with the Charlson Comorbidity Index that asks about the presence of 18 selected conditions associated with increased risk of mortality within one year (Katz, Chang, Sangha, Fossel, & Bates, 1996) (Appendix B). Positive responses receive a weighted score and a total comorbidity index can be calculated from the sum of the scores. Scores can range from 0 to 37.

The initial psychometric testing of this questionnaire was conducted in a sample of older hospitalized adults (N = 170). Evaluation of test-retest reliability was conducted with 26 patients (r = 0.91). High correlations between individual items of the questionnaire with the Charlson Comorbidity Index provided evidence of concurrent validity (r = 0.83 to r = 1.00).

A study of HMO members over the age of 65 years (N = 137) also provided evidence of construct validity. Researchers examined the relationship between self-reported physical function using the physical function scale of the SF-36 and different measures of comorbidity (Bayliss, Ellis, & Steiner, 2005). Correlations between physical function and comorbidity were strongest when comorbidity was measured as self-reported disease burden (r = -0.63, p < .001), but the correlation was also strong when comorbidity was measured using number of conditions by chart review (r = -0.52, p < .001), self-reported number of conditions (r = -0.48, p < .001) and the total score on the Charlson Comorbidity Index (r = -0.41, p < .001). Similarly strong correlations were reported between these tools and reported overall health status.

A modified version of the Charlson Comorbidity Index that also included five chronic conditions commonly associated with aging (arthritis, thyroid disease, hearing loss, vision loss, and urinary problems) was used in one FM study of older adults. Although the researcher found that comorbidity as measured with the modified tool contributed to 6.8% of the variance in physical function, comorbidity levels were low in the sample (1.7 $\pm$ 1.47) and the levels were not significantly different between two age groups (55 – 64 years of age and over 65 years of age). Participants were also asked about these five conditions in this study, but the original Charlson Comorbidity Index was used in the analyses.

Depressive symptoms. Depressive symptoms were measured with a shorter version of the Geriatric Depression Scale (GDS), a 5-item scale (GDS-5) developed by Hoyl and colleagues (1999). The original Geriatric Depression Scale (GDS) was the first depression screening scale to be developed for use with older adults and differs from others by focusing less on somatic complaints which are highly prevalent in older populations and by giving more weight to psychological symptoms that can more effectively discriminate between depressed and non-depressed older adults (Yesavage et al., 1982). It was created by a team of experts in geriatric psychiatry who administered 100 depression screening items to older adults who were either living in the community and had no complaints of depression or being hospitalized for depression (N = 47). Items that exhibited the best correlations (r = 0.47 to 0.83) with the total depression score (100 items total) were selected for the GDS. Interestingly, none of the 12 somatic items that were included in the pool of 100 items were among the 30 items selected for the GDS.

Three years later, Sheikh and Yesavage (1986) proposed a shortened version by selecting items that had the highest correlation with depressive symptoms in the original GDS validation study, and thereby reduced the number of items from 30 to 15. The 5-item scale used in this study was developed from the GDS-15 (Hoyl et al., 1999) and includes the following items: 1) Are you basically satisfied with life, 2) Do you often get bored, 3) Do you often feel helpless, 4) Do you prefer to stay home rather than going out and doing new things, And 5) Do you feel pretty worthless the way you are now. All of the GDS forms use a yes/no format to reduce potential for confusion that can occur with a greater number of semantic choices. Items are positively and negatively worded and each response that indicates depression is scored with 1 point. The 5-item scale is one-dimensional and was not designed with subscales. Total scores range from 0 – 5, with higher scores indicative of higher levels of depressive symptoms. The developers of the original GDS emphasized that the GDS was intended to be used as a screening tool for depression by measuring of the level of depressive symptoms, not as a diagnostic tool. However, a cut off score of 1 has been identified as indicative of possible depression.

Evidence of construct validity has been drawn from reports of statistically significant correlations between the GDS-5 and GDS-15, a measure that also correlates strongly with the original GDS (r = 0.84, p < .001) (Sheikh & Yesavage, 1986). The GDS-5 was examined in elderly hospitalized and community-dwelling persons and high correlations with the GDS-15 (r = 0.85 and 0.84, respectively) were found (Nguyen, Inderjeeth, Tang, Barnabas, & Merriam, 2006). Evidence of construct validity has also been drawn from reports of high sensitivity and specificity rates. Initial testing of the GDS-5 in a sample of VA patients revealed high sensitivity and specificity rates (97% and 85%, respectively) and 90% global diagnostic accuracy which was higher than the rates for the GDS-15 (Hoyl et al., 1999). Weeks et al (2003) examined the GDS-5 in hospitalized elders and found that the 5-item scale had the highest sensitivity rate (.97) when compared to other shortened versions of the GDS (GDS-15 and GDS-4). Internal consistency of the 5-item scale is less than that of the larger GDS scales (r = 0.80) but that is not surprising given that internal consistency measures increase with a greater number of items (Hoyl et al., 1999).

None of the versions of the GDS have been used in FM populations, but Karp, Rudy, and Weiner (2008) recently examined item response bias in the original 30-item GDS due to presence and intensity of persistent pain in community-dwelling older adults with low back or knee pain that had persisted for at least three months (*n* = 677) along with a pain-free control group (*n* = 201). The average duration of pain in the pain group was 12.8 $\pm$ 14.1 years. Ten of the thirty GDS items displayed significant differential item functioning (DIF) due to presence and/or intensity of persistent pain in the analysis and were removed from the tool. The removed items clustered into three categories: low energy/isolation (life is not exciting, life is empty, dropped activities, no energy, prefer to stay home, and don't enjoy getting up in morning), anxiety (fidgety/restless, bothered by thoughts), and cognitive (more problems with memory than most, mind not as clear as it used to be). None of the items that were removed were conceptually linked with depressed mood, anhedonia, or hopelessness.

Psychometric testing of the revised 20-item GDS-PAIN revealed that the revised scale correlated highly with the GDS ($r = 0.96$) and the Cronbach's alpha for the revised scale was 0.87 compared to 0.89 for the GDS. The difference in GDS-PAIN scores between the pain and control groups was similar to that observed between other pain and non-pain groups using the GDS (0.83). Differences in sensitivity and specificity were analyzed by calculating a cut-off score based on a score of 10 on the 30-item GDS. There was a statistically significant difference between the scale classifications of depressed persons (χ^2 (1) = 444.1, p = .0001). The 30-item GDS classified 86 persons (12.7%) in the pain group as depressed, but only 59 (9%) were classified as depressed by the 20-item GDS-PAIN.

These findings are very relevant to the study of depressive symptoms in older adults with FM, who live with persistent pain. One of the ten items removed from the GDS is on the GDS-5 being used in this study: 2) Do you prefer to stay at home, rather than going out and doing new things? Because of the limited evidence (one study), however, this item was not removed from the GDS-5 being used in this study.

Body mass index (BMI). Body mass index was calculated as self-reported weight (kg) divided by the square of self-reported height $(\text{meters})^2$ (Garrow & Webster, 1985). Because underweight and overweight are both associated with physical function, BMI was categorized into four levels based on accepted categorizations published by the NIH to examine the relationships of each BMI category to physical function (US Department of Health and Human Services, 1998). The four BMI categories are: *Low = < 18.5; Normal = 18.5 – 24.9; Overweight = 25.0 – 29.9; Obesity ≥ 30.0.*

Physical activity. Physical activity was measured using the Community Healthy Activities Model Program for Seniors (CHAMPS) Questionnaire that was developed to evaluate the effect of planned interventions on physical activity of community-dwelling older adults in the United States (Stewart et al., 2001). The questionnaire includes 41 items that explore the frequency and duration of light, moderate, and vigorous physical activities that have been performed weekly over the last 4 weeks. Frequency is determined by having participants report if an activity was performed in the past 4 weeks (Y/N) and, if yes, how many times in one week. Participants also rated the hours per week spent doing the activity by selecting from a 6-point scale ranging from *less than 1 hour* to *9 or more hours*. Caloric expenditure was scored in MET values for all activities. Four different scores can be derived from the questionnaire: frequency of moderate or greater activity (MET > 3.0); frequency of all physical activity (light, moderate, and vigorous); caloric expenditure of moderate or greater activity; caloric expenditure of all physical activity. Caloric expenditure of all activity was scored for this study. Higher scores indicate greater frequency or caloric expenditure. There are no published levels of activity for persons with FM, but the creators of the CHAMPS physical activity measure identified three levels of activity that have been used to establish baseline measures of physical activity in intervention studies. The 'Sedentary' level referred to persons who did not set aside time for exercise or recreational sports (M = 1843 cal/wk, SD = 198). Persons who were labeled as 'Somewhat Active' were those who had set aside time for exercise but did not meet ACSM's guidelines of exercising 3 times/wk in moderate-intensity exercise for at least 20 minutes, and had been doing this for at least 3 months (M = 2116 cal/wk, SD = 157). The third level identified persons as 'Already Active' and included those who met the CDC/ASCM 1995 guidelines (M = 3386 cal/wk, SD = 219) (Stewart et al., 2001).

The CHAMPS Questionnaire has not been used with FM populations, possibly because the studies of physical activity in FM have focused on younger populations. However, there is substantial evidence of reliability and validity of the CHAMPS when used with community-dwelling older adults. Psychometric testing with community dwelling older adults (N = 173) participating in an intervention trial revealed 6-month stability for frequency and energy expenditure scores that ranged from r's = 0.58 — 0.67 (Stewart et al., 2001). The four measures of physical activity also discriminated between three known groups previously identified as varying in activity level. Hypothesized relationships between baseline physical activity measures and construct validity measures (lower body functioning, 6-minute walk, self-reported physical function, self-reported energy/fatigue, pain and psychological well-being) were weak (0.02 – 0.17) but generally supported in the study.

Harada et al. (2000) evaluated the CHAMPS along with two other measures of physical activity (Yale Physical Activity Survey-YPAS and Physical Activity Scale for the Elderly-PASE) in older adults recruited from community centers (*n* = 36) and retirement homes (*n* = 51). They found that reliability (intra-class correlations) for all CHAMPS activities was 0.62, and was higher for moderate intensity activities (0.76). Intercorrelations between the three measures ranged from 0.58 to 0.68 and correlations between CHAMPS and selected physical function and general health measures provided evidence of construct validity. Correlations with performance measures were statistically significant and ranged from 0.36 (Mini-Log Ankle) to 0.54 (6-minute walk). Correlations with general health measures were also statistically significant, somewhat stronger with physical function (r = 0.39-0.41) and general health (r = 0.35-0.42) than with pain (r = 0.26-0.28) and mental health (r = 0.25-0.28).

Giles and Marshall (2009) examined the psychometric properties of a mailed version of the CHAMPS in a sample of older Australian adults (N = 100). Intraclass correlation for all activities was .84 and test-retest correlations ranged from .62 to .68. Correlations between step counts and CHAMPS walking frequency and duration provided evidence of construct validity (r = .57 and r = .40, respectively).

When compared to a short form international physical activity questionnaire in a sample of patients with FM (N = 30), test-retest reliability was higher for the CHAMPS tool (ICC = .58, $p < .001$) (Kaleth, Ang, Chakr, & Tong, 2010). However, no statistically significant correlations between either of the physical activity self-report measures and physical performance measures assessed with accelerometry were observed. This may have been related to the fact that the study was limited by a small sample size and was not sufficiently powered to detect correlations below .50. Further testing of this tool with older adults living with FM is warranted to determine if this tool is valid and reliable in this population.

Data Analysis

Questionnaires were examined for missing data and one follow-up phone call was made to attempt to collect this data prior to entering the questionnaire data into a web-based survey data entry program. Entered data were then transferred to a Predictive Analytics Software (PASW) file where it was cleaned and patterns of missing data were examined. Cases with missing data were deleted from the analysis because less than 5% of the cases had missing data and the pattern was random (Tabachnick & Fidell, 2001). Variables (e.g., frequency of physical activity) that were not critical to the analysis and were missing significant amounts of data were also eliminated. PASW compensates for missing data in almost all analyses, so no additional measures were taken to fill missing values.

Descriptive statistics were used to explore the sample demographics (age, gender, education, income ethnicity, race, marital status) and health-related measures (levels of self-reported physical function, FM impact, FM pain, resilience, comorbidity, BMI, physical activity, tangible social support, and depressive symptoms). Scores were calculated for the following measures: LLFDI-function scale (scores transformed to 0-100 scale), Resilience Scale, FIQR, Charlson Comorbidity Index Questionnaire, CHAMPS Physical Activity Scale for Older Adults, MOS tangible social support scale, and the 5-item Geriatric Depression Scale (GDS-5). BMI was calculated from self-reported height and weight data and also categorized into low, normal, overweight and obese levels.

Demographic information was summarized using means and standard deviations for continuous data (age, income, tangible social support, FM impact, comorbidity, depressive symptoms, BMI, physical activity, pain, self-reported physical function, and resilience). Frequencies and percentages were used to report categorical data (gender, education, BMI category, marital status ethnicity, and race). The statistical analysis was carried out according to the study aims. Bonferroni adjustment techniques were used to reduce the chance of a Type I error when multiple tests were conducted.

Aim #1. The first aim was to explore levels and correlates of resilience in community-dwelling older adults living with FM. Levels of resilience were identified in the summary of demographic data. In order to examine the correlates of resilience, relationships between the interval level variables of interest (age, FM impact, FM pain, self-reported physical function, comorbidity, BMI, physical activity, depressive symptoms, tangible social support, and resilience) were expressed in Pearson product moment correlations. Kendall's tau was the correlational technique used to examine relationships with between variables that had at least one categorical variable (education and income).

Using the Bonferroni approach to control for Type I error when calculating multiple correlations, a conservative value of $p < 0.005$ was selected and required for statistical significance (C. Asp, personal communication, February 23, 2010). Cohen's benchmark for effect size was used to evaluate the strength of the correlations (Pedhazur & Schmelkin, 1991): ES = .20 to .49 as a small effect, ES = .50 to .79 as a medium effect, and ES = .80 or greater as a large effect.

Aim #2. The second aim was to ascertain which variables significantly predict self-reported physical function among older persons with FM. Following the examination of the bivariate correlations, multiple regression analysis was used to examine the hypothesized predictors of self-reported physical function (age, education, income, comorbidity, BMI, physical activity, tangible social support, and depressive symptoms). Intercorrelations among study variables were examined and assessed for multicollinearity. Highly correlated variables ($r > .80$) were evaluated to determine if they should be grouped into separate blocks or removed from the analysis. The appropriateness of the normality assumption underlying linear regression was also assessed.

A value of $p < 0.05$ was considered to be statistically significant. Because there was evidence that these variables predict self-reported physical function in older adults, a moderate effect was considered to be clinically important ($R^2 \geq 0.13$). Individual variables with statistically significant *b coefficients* and bivariate correlations $r \geq .36$ were considered clinically important.

Aim #3. The third study aim was to examine FM pain and resilience as predictors for self-reported physical function after controlling for covariates. Variables with non-significant individual *b* coefficients identified in analysis of the second aim were removed from the analysis of this third aim. Hierarchical multiple regression analysis was used to examine FM pain and resilience as predictors of self-reported physical function while controlling covariates identified in Aim #2. Interactions between FM pain and resilience were also examined using techniques described by Baron and Kenny (1986). Variables retained from Aim #2 were entered in the first step, FM pain in the second step, resilience in the third step, and an interaction term (resilience x pain) was entered in the fourth step. The appropriateness of the normality assumption underlying linear regression was also assessed.

A value of $p < 0.05$ was considered to be statistically significant. The main effects of pain or resilience were each considered clinically important if the corresponding increase in R^2 is statistically significant. Since there has been no evidence of research exploring the moderating effect of resilience (FM pain x resilience), the smallest statistically significant effect size that can be detected while controlling for the covariates, pain and resilience was considered to be clinically important (R^2 *change* $\geq$ 0.02).

Chapter 4: Results

This study utilized a descriptive, cross-sectional design in a convenience sample of community-dwelling older adults, all of whom were over 50 years of age, and diagnosed with FM. This chapter describes the results of the study and is organized by the specific aims of the study.

Sample Description

A total of 400 questionnaires were mailed once during October and November 2009 and 224 were returned (56% response rate). Sample characteristics may be found on Table 2. The sample was predominantly female (94%), Caucasian (92%) and Non-Hispanic/Non-Latino (92%). The participants ranged in age from 50 to 81 with an average age of 62.1 years (*SD* = 6.75). Socioeconomic status was fairly high with 85% reporting at least a high school education and nearly half (44%) reporting a college degree, and only 26% reporting income of less than $20,000/yr (38% earned > $50,000/yr). Two thirds of the sample (68%) was married. Subjects reported tangible social support scores ranging from 0 to 100, averaging 59.45 (*SD* = 33.94) on a 100-point scale, with over one-third reporting high levels of tangible support.

In terms of health-related characteristics (Table 3), persons in this sample reported experiencing symptoms from 2 to 70 years with an average duration of FM symptoms of 23.31 years (*SD* = 12.9), much longer than the years since diagnosis of FM (*M* = 14.72 years, *SD* = 7.1). The difference between time with symptoms and time since diagnosis is accounted for by the fact that the ACR diagnostic criteria were first published in 1990. The overall impact of FM, as measured by scores on the FIQR, ranged from 10 to 97, and averaged 46.64 (*SD* = 18.73) which represents a moderate level of FM impact (Bennett, Bushmakin, Cappelleri, Zlateva, & Sadosky, 2009). Overall, symptom intensities ranked in the moderate range. Difficulty sleeping had the highest mean score

Table 2. Sample Characteristics (Demographic Variables)

Variable	**Mean ± *SD***	***n***	**%**
Age	62.1 ± 6.75 years	221	
50-54		39	18%
55-59		48	22%
60-64		46	21%
65-69		55	25%
70+		33	15%
Gender		224	
Female		211	94%
Male		13	6%
Education		224	
High School or less		34	15%
AD/Some college		89	40%
BA		63	28%
Advanced degree		35	16%
Race		224	
American Indian/Alaska Native		11	5%
Asian		1	.4%
Black		5	2.2%
White		207	92%
Marital Status		223	
Never Married		8	3.6%
Married		144	64%
Living together as married		8	3.6%
Separated, Divorced, Widowed		63	28.1%
Income		208	
Less than $20,000/yr		55	26%
$20,000 to $40,000		52	25%
$40,000 to $75,000		68	33%
Greater than $75,000		33	16%
Tangible Social Support (0-100)	59.4	221	
Low (0 – 25)		54	24%
(26 – 50)		39	18%
(51 – 75)		48	22%
High (76 – 100)		80	36%

among the symptoms (*M* = 6.79, *SD* = 2.67) and depression had the lowest mean score (*M* = 4.08, *SD* = 3.13). Pain intensity ranked sixth with a mean of 5.47, *SD* = 2.16.

Depressive symptoms were also present in this sample, ranging from none to 5 with an average score of 2.02, *SD* = 1.63. This moderately low level of symptoms is consistent

Table 3. Sample Characteristics (health-related variables)

Variable	**Mean ± *SD***	***n***	**%**
Length of time with FM symptoms	23.31 ± 12.9 years	211	
Length of time since FM diagnosis	14.72 ± 7.1 years	211	
Total FM Impact (0-100)	49.64 ± 18.73	215	
Difficulty Score (0-30)	12.68 ± 7.15	218	
Impact Score (0-20)	9.16 ± 5.58	220	
Symptom Score (0-50)	27.91 ± 8.53	222	
Difficulty sleeping (0-10)	6.79 ± 2.67	223	
Tenderness to touch (0-10)	6.60 ± 2.76	224	
No energy (0-10)	6.54 ± 2.37	224	
Stiffness (0-10)	6.19 ± 2.33	224	
Balance problems (0-10)	6.11 ± 2.82	224	
Pain (0-10)	5.47 ± 2.16	224	
Memory problems (0-10)	5.03 ± 2.86	223	
Sensitivity to noise (0-10)	4.81 ± 2.63	224	
Anxiety (0-10)	4.15 ± 3.12	224	
Depression (0-10)	4.08 ± 3.13	224	
Geriatric Depression Scale (GDS-5)	2.02 ± 1.63	215	
Charlson Comorbidity Index (0-37)	1.09 ± 1.36	206	
Asthma		55	25%
Diabetes		36	16%
COPD, emphysema, chronic bronchitis		24	11%
Charlson Comorbidity Index Plus (0-42)	2.45 ± 1.71	206	
Arthritis		123	55%
Thyroid		78	35%
Hearing Problem		73	33%
Body Mass Index (17.75 – 81.5)	29.82 ± 7.27	219	
Underweight		1	.4%
Normal weight		55	25%
Overweight		75	34%
Obese		88	39%
Physical Activity (calories/wk, 0-9345)	2533.42 ± 2182	219	
Light housework		195	87%
Walk to do errands		131	59%
Stretching/Flexibility exercises		119	53%
Walk leisurely for exercise/pleasure		111	50%

with the finding that the lowest mean symptom score in the FIQR was depression. Post hoc testing revealed a moderate correlation between the two depression measures (r = .59, $p < .000$).

The presence of comorbidities (Table 3) ranged from none to 8 and was, on average, quite low as measured with the Charlson Comorbidity Index (M = 1.09, SD = 1.36). However this standardized measure of comorbidity does not assess the presence of chronic conditions associated with aging so participants were also asked about five of these chronic conditions (arthritis, thyroid disease, hearing loss, vision loss, and urinary problems). Post hoc analysis revealed that the mean for the modified Charlson Comorbidity Index (CCI-Plus) that also included the five conditions associated with aging more than doubled to M = 2.45, SD = 1.71 (osteoarthritis, 55%, n = 123, thyroid disease, 35%, n = 78, hearing problems, 33%, n = 73, vision problems, 4%, n = 8, and urinary problems, 8%, n = 17).

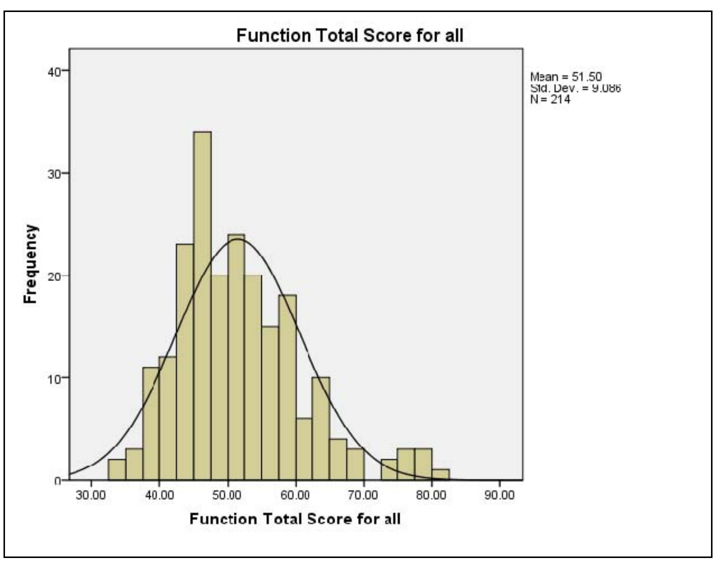
Participants reported physical activity to be an average caloric expenditure of 2,533 calories/week (SD = 2182) which is a little higher than the mean for the 'somewhat active' level described by developers of the CHAMPS tool (M = 2116, SD = 157) and well above the level they identified as 'sedentary' (M = 1843, SD = 198) (Stewart et al., 2001). The most frequent types of activities (see Table 3) used to calculate the caloric expenditure centered around walking (errands, 59%, n = 131, leisurely, 50%, n = 111, uphill, 28%, n = 63, fast, 22%, n = 50), housework (light, 87%, n = 191, heavy, 31%, n = 69), and gardening (light, 71%, n = 158, heavy, 30%, n = 68). Very few reported engaging in strenuous activities like aerobics (5%, n = 11), jogging (4%, n = 8), swimming (8%, n = 18), or moderate to heavy strength training (7%, n = 16). Slightly more reported they practiced yoga (13%, n = 30), regularly exercised (15%, n = 33) and did light strength training (19%, n = 43). Sedentary activities that are not used to calculate the caloric expenditure were among those most frequently selected by the participants (reading, 96%, n = 214, visiting with friends, 88%, n = 197, using a computer, 88%, n = 197, attending concerts, 45%, n = 100, and attending church, 38%, 85). Notably, the BMI levels (Table 3) were quite high in this sample—only 25% (n = 55) were in the normal weight range, one was underweight and the rest were classified as either overweight (35%, n = 75) or obese (40%, n = 88).

Aim 1 Levels and Correlates of Physical Function, FM Pain, and Resilience

The first aim of the study was to examine the levels and correlates of physical function, pain, and resilience. This was a descriptive aim and had no hypothesis. Frequency distributions of scores from measures of physical function, pain, and resilience were examined to determine the levels of each of these variables in this sample.

Physical function scores ranged from 33 to 82 and averaged 51.5 (SD = 9.09). According to the scoring guidelines, levels of physical function have not been established but scores approaching 100 signify high levels of overall function.

Figure 4. Distribution of Physical Function Scores



The mean score for this sample indicates a moderate level of functioning. As seen in Figure 4, the scores are negatively skewed towards the lower range of function. Pain scores ranged from 0 to 10 and averaged 5.47 (*SD* = 2.16). The scores were categorized into three levels: mild (1 – 3), moderate (4 – 6), and severe (7 – 10).

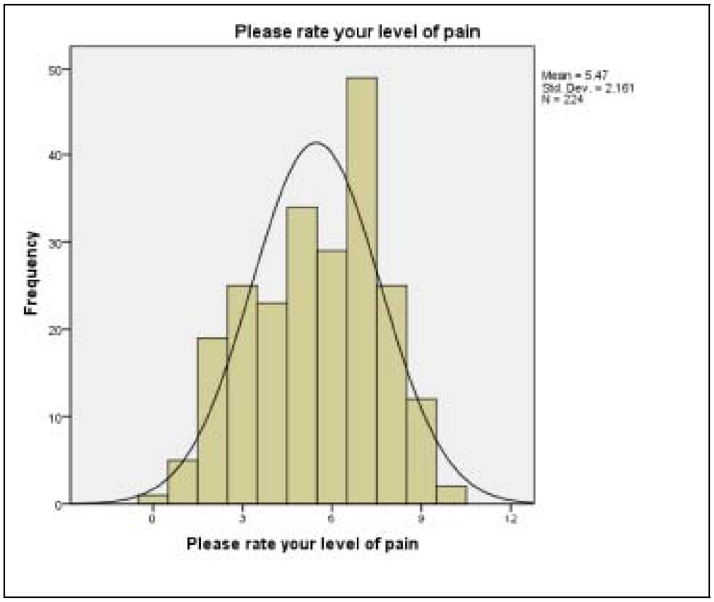
Pain levels in the sample were relatively high, with 77% (n = 174) reporting moderate or severe pain; see Table 4.

Table 4. Levels of Pain (N = 224)

Pain Level (0 — 10)	n	%
• 1 – 3 (Mild)	50	22%
• 4 — 6 (Moderate)	86	38%
• 7 — 10 (Severe)	88	39%

As shown in the histogram (Figure 3), the scores are positively skewed towards the higher levels of pain in this sample.

Figure 5. Distribution of Pain Scores



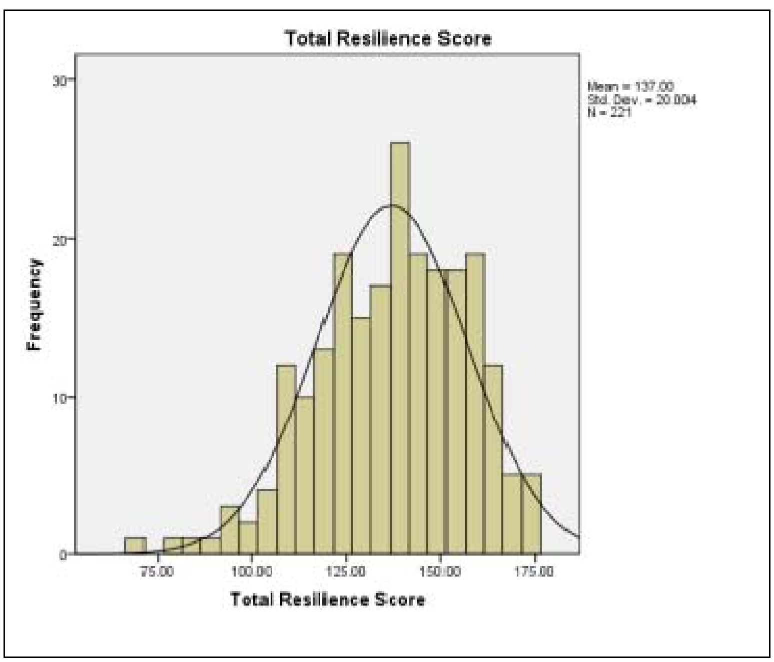
Despite the limited physical function and high levels of pain, the level of resilience was moderately high in this sample (see Table 5). The resilience scores ranged from 69 to 174 and were categorized into three levels: low (25-125), moderately low/moderate (126-145), and moderately high/high (146-175). Although the average resilience score was considered moderately low/moderate (M = 137, SD = 20), over one third of the sample (37%) reported a moderately-high/high level of resilience.

Table 5. Levels of Resilience (n = 221)

Resilience (25-175)	n	%
• 25 – 125 (Low)	62	28%
• 126 — 145 (Moderately-Low to Moderate)	77	35%
• 146 — 175 (Moderately-High to High)	82	37%

As shown in the graphic display (Figure 6), scores were positively skewed towards the higher end of the resilience scale.

Figure 6. Distribution of Resilience Scores



Correlations were then examined for sample and health characteristics with physical function, pain, and resilience. Because a large number of correlations can lead to a higher risk of spuriously significant associations, the Bonferroni approach was used to set a conservative level of significance that would reduce this risk ($p < .005$). Cohen's benchmark for effect size was also used to evaluate the strength of the correlations. Table 6 displays the correlations that were statistically significant (p < .005) and greater than or equal to 0.20.

Table 6. Clinically Important Correlates of Physical Function, Pain, and Resilience

	Physical Function	Pain	Resilience
Pain	-.54***		
Resilience	.32***	-.21**	
Age			.20**
Income	.27***		
BMI	-.29***		
Physical Activity	.20**		
GDS-5	-.36***	.33***	-.54***
FIQR	-.72***	.70***	-.40***
Comorbidity	-.20**		

**p<.005; ***p<.001

The strongest correlate of physical function was the total score on the FIQR which assessed FM impact (r = -.72); there was a negative relationship between physical function and FM Impact. Physical function was moderately and negatively correlated with pain, and small negative correlations were observed between physical function and depressive symptom scores on the GDS-5, BMI, and comorbidity. Small positive and clinically important correlations were found between physical function and income, physical activity, and resilience. Significant correlations were observed between physical function and age (r = -0.15, p < .01) and physical function and education (r = 0.18, p < .001) but the size of the correlations did not meet the criteria for clinical importance. Correlations between physical function and tangible social support (r = -0.003) and gender (*r* = 0.009) were very small and not significant.

The strongest correlate of pain was the measure of FM impact. This strong positive correlation (*r* = .70) was likely due to the similar items that assessed pain in both instruments. As noted earlier, there was a moderate negative correlation between pain and physical function scores. Pain scores were positively but weakly related to depressive symptom scores on the GDS-5. Scores on pain and resilience measures were negatively related but the correlation was small. There were statistically significant but clinically unimportant correlations between pain and comorbidity scores (*r* = 0.18, p < .05), BMI scores (*r* = 0.13, p < .05), years of education (*r* = -0.14, p < .01), and income categories (*r* = -0.17, p < .01). Separate correlations for pain scores with age (*r* = -0.02), physical activity (*r* = -0.04) and tangible social support (*r* = -0.03) were neither statistically significant nor clinically important.

Depressive symptom scores (GDS-5) and FM impact scores (FIQR) both correlated moderately and negatively with resilience. A weak positive correlation between resilience and age was also observed in this sample. Statistically significant positive correlations were observed between resilience and physical activity scores (*r* = 0.16, p < .01) and income (*r* = 0.15, p < .01) but these were not large enough to be considered clinically important. Correlations for resilience scores with scores on comorbidity (*r* = -0.05), BMI (*r* = -0.02), and tangible social support (*r* = 0.10), as well as years of education (*r* = 0.01) were neither statistically significant nor clinically important.

Aim 2 Predictors of Physical Function

The second aim was to examine theorized demographic and health-related predictors of self-reported physical function in community dwelling older adults living with FM. It was hypothesized that age, education, income, tangible social support, comorbidity, depressive symptoms, BMI, and physical activity would predict self-reported physical function. Self-reported physical function was scored using the function scale of the LLFDI (Cronbach's $\alpha = .96$). The scores ranged from 33 to 82 and averaged 51.5 (*SD* = 9.09) (Figure 4).

All of the theorized demographic and health-related variables were entered into the regression analysis to examine their ability to predict the scores of self-reported physical function. Correlations were examined for multicollinearity, indicated by correlations between variables in a regression analysis with an absolute value above .70. The highest correlation in the analysis was between physical function and income ($r = .37$), so multicollinearity was not deemed a problem in this analysis. Clinically important findings were previously determined to be statistically significant correlations > .36. Using this criteria, the only clinically important correlation noted in this portion of the analysis was the correlation between self-reported physical function and depressive symptoms ($r = -0.36$, $p < .001$).

Linear multiple regression analysis was performed between the self-reported physical function scores as the dependent variable and the eight independent variables including the characteristics of age, education, income, and tangible social support, and the health characteristics of comorbidity, depressive symptoms, BMI and physical activity. Table 7 displays the results of the multiple regression analysis. The overall regression equation was significant ($F(8, 190) = 10.62$, $p = .001$). Altogether 32% (29% adjusted) of the variance in self-reported physical function scores was predicted by knowing scores of the predictor variables. This amount of variance is more than double the amount considered clinically important (13%).

Table 7. Multiple Regression Analysis: Self-Reported Physical Function Regressed on demographic and health-related variables

Predictor Variable	b	Standard Error	*b**	t
Age	-0.19	.08	-0.14	-2.19*
Education	0.92	.44	0.18	2.10*
Income	0.87	.34	0.18	2.55**
Tangible Social Support	-0.06	.10	-0.04	-0.61
Comorbidity	-0.67	.43	-0.10	-1.54
GDS-5	1.41	.37	-0.25	-3.83***
BMI	-0.28	.08	-0.23	-3.43***
Physical Activity	0.00	.00	0.13	2.09*

*p<.05; **p<.01; ***p<.001

Age, income, education, depressive symptoms, BMI, and physical activity scores were all statistically significant predictors and contributed uniquely to the variance in physical function. The largest standardized regression coefficients were associated with depressive symptoms (*b** = -.25) and BMI (*b** = -.23). Comorbidity and tangible social support were not statistically significant predictors of physical function and were removed from the analysis of the third aim. The residual plot revealed that the assumptions of the multiple regression were met. There were no outliers, relationships were linear and there was evidence of homoscedasticity and normal distribution of values (Tabachnick & Fidell, 2001).

Aim 3 Examining Resilience as a Moderator

The third aim was to examine resilience as a moderator of the relationship between FM pain and self-reported physical function. The hypothesis was that high levels of resilience moderate (weaken) the relationship between pain level and self-reported physical function when controlling for significant predictors of self-reported physical function. Using hierarchical regression analysis, statistically significant predictors identified in the second aim were entered into the first step (age, education, income, depressive symptoms, BMI, and physical activity), pain level scores in the second step, resilience scores were entered in the third step, and an interaction term (pain x resilience) in the fourth step. Correlations among the variables were again examined for multicollinearity. The highest correlation in this analysis was between depressive symptom and resilience scores (r = -0.54) so multicollinearity was not deemed a problem in this analysis. The residual plot revealed that the assumptions of the multiple regression were met. There were no outliers, relationships were linear and there was evidence of normal distribution of values and homoscedasticity (Tabachnick & Fidell, 2001).

Table 9 displays the results of the hierarchical regression analysis in the third stage of the analysis. In the first step, the equation was significant, (F(6, 192) = 14.22, p < .001) and the selected demographic and health-related predictors accounted for 30% (29% adjusted) of the variance in self-reported physical function. Pain contributed another 15% of the variability in physical function scores, (F(1,191) = 50.62, p < .001). In the third step, resilience scores added another 3% to the variance in physical function scores, yielding a significant equation (F(1, 190) = 9.36, p < .001), and adding to the predictors for total of 48% of the variability accounted for in physical function scores. The interaction variable entered in the fourth step did not significantly contribute to the variance in self-reported physical function.

Four independent variables entered in the first step uniquely contributed to the prediction of physical function scores: age (b_i* = -.18, t = -3.22, p = .002), with higher age predicting lower physical function scores; income (b_i* = .13, t = 2.20, p = .029), with lower income predictive of lower physical function scores; BMI (b_i* = -.24, t = -4.39, p = .001) with higher BMI predictive of lower physical function scores; and physical activity (b_i* = .13, t = 2.33, p = .021), with lower physical activity predictive of lower physical function scores.

Table 8. Hierarchical Regression Analysis: Self-Reported Physical Function Regressed on demographic and health-related variables (1st step), pain (2nd step), resilience (3rd step)

Predictor Variable	b	Standard Error	b_i*	b_{ii}*	b_{iii}*	t
Age	-0.24	.07	-0.18			-3.22**
Income	0.64	.29	0.13			2.20*
Education	0.53	.38	0.08			1.41
BMI	-0.30	.07	-0.24			-4.39***
Physical Activity	0.00	.00	0.13			2.33*
GDS-5	-0.18	.37	-0.03			-0.49
Pain	1.71	.24		-0.41		-7.13***
Resilience	0.09	.03			0.20	3.06**

*p<.05; **p<.01; ***p<.001

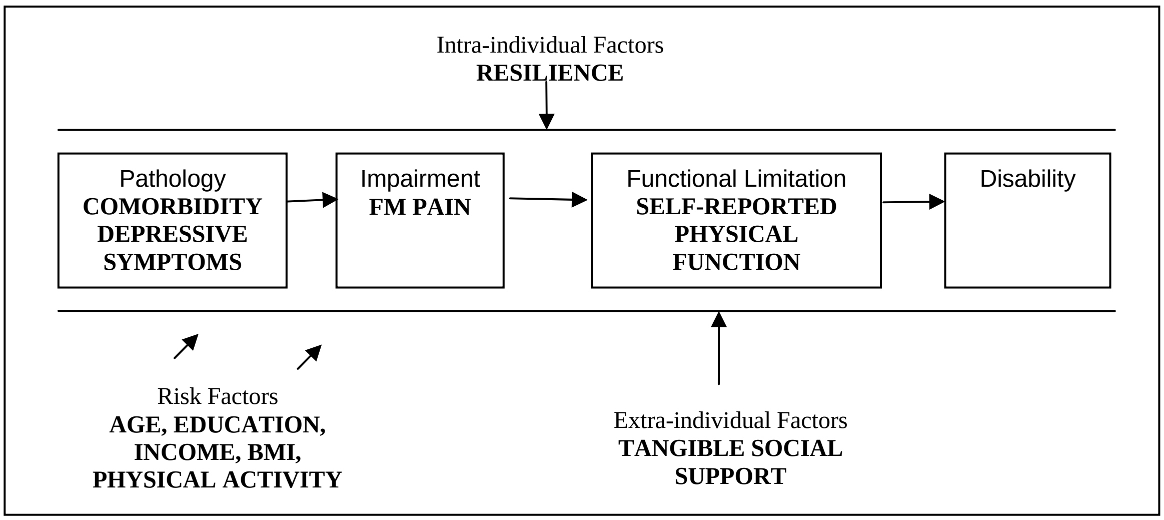
Pain and resilience scores were both statistically significant predictors and contributed uniquely to the variance in physical function. After taking into account these characteristics, higher pain scores (b_{ii}* = -.41, t = -7.13, p = .001) predicted lower physical function scores and, after accounting for pain scores, lower resilience scores predicted lower physical function scores (b_{iii}* = .195, t = 3.06, p = .003). Notably, when pain was entered into the regression analysis in the second step, the amount of variance in physical function accounted for by education was no longer statistically significant and when resilience was entered into the analysis in the third step, the contribution from depressive symptoms dropped and was also no longer statistically significant. Thus, in the final model that included pain and resilience, education and depressive symptoms no longer contributed uniquely to the variance in physical function scores.

Chapter 5: Discussion and Conclusions

This study of community-dwelling older adults living with FM has contributed five important findings to the FM and resilience literature: 1) despite limited physical function and moderate to severe pain levels, the level of resilience was moderately high in this sample; 2) age, FM impact, pain, physical function, and depressive symptoms were significant and clinically important correlates of resilience; 3) thirty-one percent (31%) of the variance in physical function scores was accounted for by 6 of 8 theorized predictors of physical function; however, tangible social support and comorbidity did not uniquely contribute to the variance in physical function; 4) pain and resilience accounted for an additional 15% and 3%, respectively, of the variation in physical function scores; 5) the level of resilience did not moderate the relationship between pain and physical function; resilience contributed uniquely to the variance in physical function. The important findings for each aim will now be discussed in the context of current research and the conceptual framework for this study. Limitations, clinical implications and potential areas for future research will also be discussed in this chapter.

The conceptual model guiding the proposed study (Figure 7) displays the demographic and health-related variables (bolded in capital letters) that were examined as potential correlates of pain and resilience, and also as predictors of self-reported physical function. The demographic variables (age, education, income) were conceptualized as risk factors factors—lifestyle behaviours, demographic factors and other pre-existing conditions that can influence the disablement process—along with BMI and physical activity. The health-related variables included pathological elements of the Disablement Process (comorbidity and depressive symptoms), an impairment (pain), a functional limitation (self-reported physical function), extra-individual factor (tangible social support), and an intra-individual factor (resilience). In the model, the intra- and extra-individual factors have the ability to influence/buffer the effect of one element of the Disablement Process on another. Resilience was examined not only as a predictor of physical function but also as a moderator of the relationship between pain (impairment) and self-reported physical function (functional limitation).

Figure 7. Conceptual Model (adapted from Verbrugge & Jette, 1994)



Sample Characteristics

The characteristics defining the sample's demographic risk factors were very similar to those described in previous FM research of older adults—participants in this convenience sample were predominantly female, Caucasian, married, well-educated, and nearly three-fourths (74%) reported incomes >$20,000/year (Burckhardt et al., 2001; Cronan et al., 2002; Hardt, Jacobsen, Goldberg, Nickel, & Buchwald, 2008; Jones et al., 2008; Shillam, 2008; Wolfe et al., 1995). These findings are consistent also with the moderately high average level of tangible social support, an extra-individual factor, which was observed as well.

The average level of the two health-related risk factors, BMI and self-reported physical activity, as measured with the CHAMPS, revealed two important characteristics of this sample. The average level of physical activity corresponded to one described by the authors of the CHAMPS instrument as ‘somewhat active’ (Stewart et al., 2001) primarily because participants engaged most often in sedentary activities (reading, visiting with friends, using the computer), and most caloric expenditure was associated primarily with two types of low-level activity—instrumental activities of daily living, and walking for leisure/exercise. The moderately low level of activity is logical given the significant weight problems that were also observed as a defining characteristic of this sample with three-fourths categorized as overweight or obese. The mean BMI was higher than the average for the general population in a similar age group (28.2 for women over 60 years of age) an observation that has been documented in other FM studies (Kindler, 2009; Neumann et al., 2008; Ogden, Fryar, Carroll, & Flegal, 2004; Shaver et al., 2006; Yunus et al., 2002).

In terms of pathology, the low level of comorbidity as measured by the Charlson Comorbidity Index was an unexpected finding in this study because there is considerable evidence that FM is associated with several other chronic illnesses, such as lupus, RA, irritable bowel syndrome (Arnold et al., 2006; Yunus, 2008). Interestingly, when five age-related conditions were added to the measure in post-hoc analysis, the comorbidity index increased, but still remained in the low range of scores. It is possible that lack of gender diversity in the sample may have limited the assessment of comorbidity in this sample. The prevalence of non-fatal painful conditions like arthritis, FM, and FM-related conditions that contribute to disability is higher in women, who also tend to live longer than men. The Charlson Comorbidity Index was developed as an index of the type of morbidity that can contribute to hospitalization and increased risk of death, so it is not surprising that the levels of comorbidity using a measure assessing risk of comorbidity associated with mortality would be low in a sample that was predominantly women. Notably, the three most common comorbidities identified in the sample—arthritis, thyroid disease, and hearing loss—and other conditions most often associated with FM like depression, panic disorder, irritable bowel syndrome, and Sjogren's syndrome—are not part of the Charlson Comorbidity Index. The focus on mortality in this accepted measure of comorbidity may have significantly limited the ability to accurately measure comorbidity in this study.

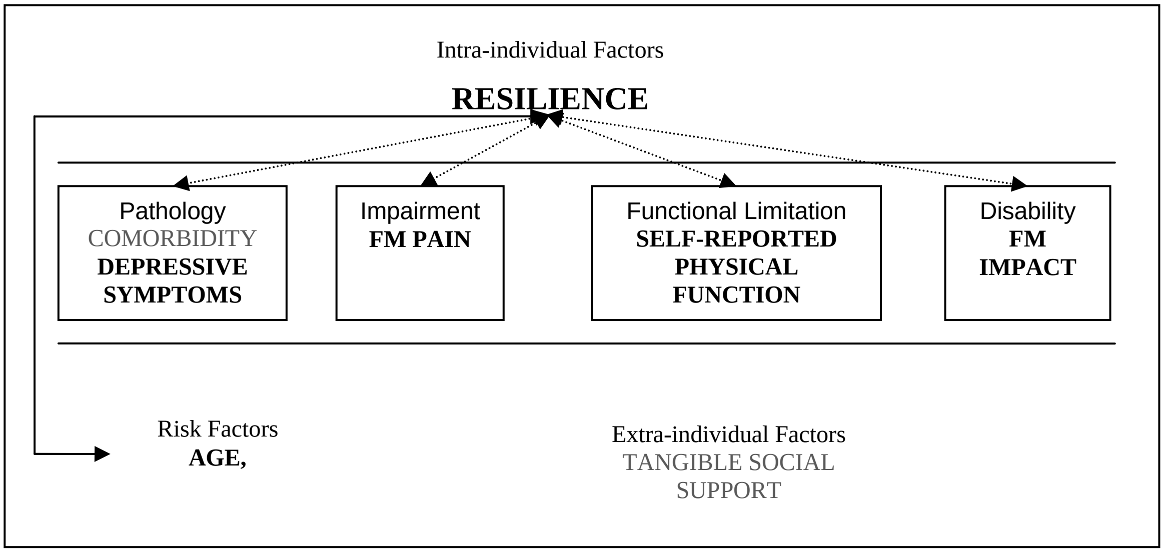
It is interesting to note that participants have lived with FM symptoms for an average of 23 years, but the average time since diagnosis was nearly half that amount (14.5 years). This finding reflects the fact that many of the older persons in this particular sample did not have the benefit of an accurate diagnosis until after the ACR FM diagnostic criteria (first published in 1990) had been incorporated into medical practice. As noted in other studies of older adults, the average level of FM impact, as measured by the FIQR, was moderate and lower than levels of impact associated with younger populations (Bennett, Friend et al., 2009). On average, levels of three important elements of the Disablement Process, depressive symptoms, pain, and physical function, as measured with the FIQR, were less than those reported in psychometric testing of the tool in younger persons with FM in the moderately low to moderate range, respectively. These reduced levels likely contributed to a level of overall FM impact in this older age group that was less than the impact reported in the younger group. The average level of impact observed in this study was similar, however, to levels reported in other studies of older adults with FM (Burckhardt et al., 2001; Cronan et al., 2002; Yunus et al., 1988). Yet, when this level of function was compared with other community dwelling older adults, it was worse than what has been reported in those who do not have FM (Haley et al., 2002; Hawker et al., 2008; Melzer, Kurz, Sarid, & Jette, 2007; Porensky et al., 2009). These findings are consistent with the understanding that FM is a very disabling condition, but that older adults, on average, have lived longer with the disease and report less impact than younger persons (Burckhardt et al., 2001)

Despite functional impairment and moderate to severe levels of pain observed in this sample, though, the average level of resilience (intra-individual factor) was moderately high. Because little is known about resilience and FM, this finding was unexpected. However, it is consistent with the assertion that resilience is strengthened by adversity (Rutter, 1993), and the adversity in this case is FM. The remainder of the discussion will focus on the key findings from the aims that help to explain why this might be so.

Clinically Important Correlates of Resilience

This study revealed that age, depressive symptoms, pain, physical function, and FM impact were significant and clinically important correlates of resilience (see Figure 8). These are all important findings because little is known about resilience and its relationship to these variables in older persons living with FM. To this author’s knowledge, this is the first study that has explored the relationship between FM impact and resilience and found a significant, clinically important negative correlation between the two variables, as well as between resilience and the variables that contribute to FM impact (pain, physical function, and depressive symptoms). This finding highlights resilience as an important factor that can be strengthened to reduce not only the negative elements of the Disablement Process, but also reduce the overall impact of FM in older adults.

Figure 8. Clinically Important Correlates of Resilience (in bolded text)



Strengthening resilience may be an effective strategy that could be implemented by nurses who are dedicated to promoting health and the enhancing engagement in meaningful activity in the persons they care for. The positive relationship between resilience and age in persons with FM validates what has been reported in other studies of older adults without FM—resilience increases with age (Bowen et al., 2003; Nygren et al., 2005). The relationships between resilience and these variables help to explain why older adults with FM, compared to younger persons with FM, report better physical function as well as less FM impact, pain, and depressive symptoms (Burckhardt et al., 2001; Cronan et al., 2002; Yunus et al., 1988). However, even though resilience increases with age, age was not separately related to these variables. There is much to be learned about resilience from older adults; there seem to be benefits to aging and maturity that have not been fully explored.

A negative relationship between resilience and pain was also observed n this study. That is, higher levels of resilience were associated with lower levels of pain, and lower levels of resilience were associated with higher pain ratings. This finding contributes to a growing body of evidence that suggests resilience, and resilience factors (high levels of self-efficacy and positive affect, low levels of depressive symptoms, neuroticism, and negative affect), can reduce pain and its impact in persons living with pain (Karoly & Ruehlman, 2006; Rejeski et al., 2001; Smith, Zautra, Wright, & Going, 2008; Wright et al., 2008). Due to age-related physiological changes, older adults often face increased health risks associated with pharmacologic treatment of pain, so building the evidence base of non-pharmacologic pain management strategies like strengthening resilience is important to older adults living with FM pain. This research provides important evidence that higher levels of resilience correspond with lower levels of pain. The alternative is also true, which highlights the continuing need to strive to effectively manage pain in persons with FM as perhaps a way to also preserve and promote resilience.

Although resilience and physical function are both associated with subjective health, the relationship between these two variables has not been studied in older adults with FM. The positive relationship between resilience and physical function observed in this study identified resilience as an important health-related variable that may also protect and preserve physical function in older adults with FM. It is also possible that improvements in physical function enhance resilience. Although it was not possible to examine causal relationships in this study, this finding supports evidence that strengthening resilient factors like self-efficacy, optimism, and positive emotions also enhances physical function (Arnstein, 2002; Wright et al., 2008)

Depressive symptoms had the strongest relationship with resilience, and, as noted earlier, also had clinically important relationships with pain and physical function in this sample. The relationship between depression and resilience is consistent with what has been reported in other studies of older adults without FM (Hardy et al., 2004; Sinclair & Wallston, 2004; Wagnild & Young, 1993) and encourages further study of this relationship in older adults with FM, especially research of interventions designed to reduce depressive symptoms by strengthening resilience. Reducing depressive symptoms could also reduce pain levels and enhance physical function based on relationships that were observed in this study, two other variables that were also correlated with depression in this sample.

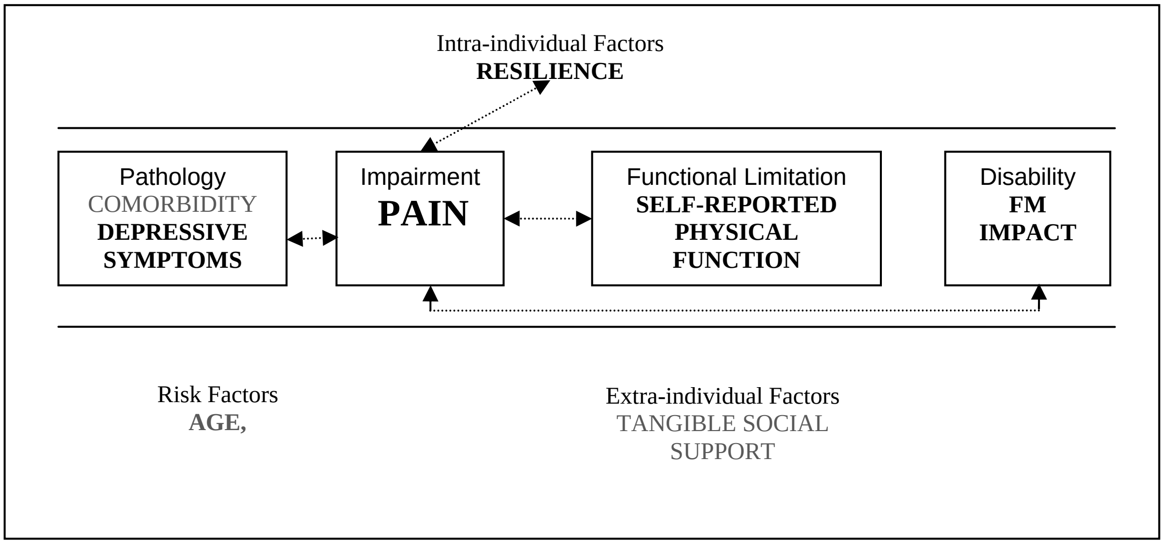
Although the positive correlation between resilience and physical activity was not large enough to be clinically important, it was statistically significant and this finding still contributes to the evidence suggesting that physical activity is associated with resilience.

Clinically Important Correlates of Pain

Pain levels were moderately high in this sample, which is not surprising, given the fact that the average duration of FM was over two decades. Figure 9 displays the clinically important relationships with pain in this study. The correlations observed between pain (impairment) and other elements of the Disablement Process—depressive symptoms (pathology) and self-reported physical function (functional limitation)—were consistent with the evidence that contributed to the development of the pathway (Nagi, 1991; Verbrugge & Jette, 1994). Pain also had a strong positive relationship with overall

FM impact; as pain increased so did the overall impact of FM. The magnitude of this relationship, however, may have been influenced by the fact that pain intensity is a component of the overall FM impact score.

Figure 9. Clinically Important Correlates of Pain (bolded text)



Nonetheless, the relationship between pain and FM impact in older adults highlights the important role pain plays in overall FM impact. Knowing this, it was not surprising to see that pain was moderately and inversely related to physical function, another element of overall FM impact. This finding is consistent with evidence that as pain increases, physical function worsens, especially in persons with widespread pain (Leveille et al., 2007; Leveille et al., 2001; Mease et al., 2008; Scudds & Ostbye, 2001).

The positive relationship between pain and depression discussed in the literature review was also substantiated in this study (Bair et al., 2003). Increased pain was associated with more depressive symptoms and less pain was associated with less depressive symptomotology. As noted earlier, depressive symptoms play an important role in the disablement process. Depressive symptomotology was the only variable that yielded clinically important relationship with pain, physical function, and resilience.

Clearly, there is a need to further explore these relationships between depressive symptoms and pain, physical function, and resilience in order to design appropriately targeted interventions.

The relationships between pain and the demographic and health-related risk factors did not meet the criteria for clinical importance. This is somewhat unexpected given empirical evidence that advanced age, high levels of comorbidity and BMI, as well as low levels of education and income are all associated with pain (Abeles et al., 2007; Jones et al., 2008; Katz et al., 2006; Mease et al., 2007; Neumann et al., 2008; White et al., 1999b; Yunus et al., 2002). The lack of a relationship between pain and age means that the level of pain did not vary with an increase (or decrease) in age. The restricted age range in this study may have limited the ability to detect a significant relationship between these variables. This finding, however, is consistent with evidence from other studies that pain levels in older adults were not significantly different from those of younger persons even though overall FM impact was less in older adults (Burckhardt et al., 2001; Yunus et al., 1988). It is important to note that, although the mean pain rating in this sample was slightly lower than what has been reported in other studies that included older and younger age groups, the rating is still within the moderate level of pain that is reported in other studies (Bennett, Friend et al., 2009; Burckhardt et al., 2001; Jones et al., 2008). The moderate and severe levels of pain reported in this study are also noteworthy in the face of the clinically important relationships observed between pain intensity and the variables of physical function, depression, resilience and overall FM impact as discussed earlier.

An earlier study of relationships between medical conditions, symptoms, and physical functioning in older adults revealed that pain and fatigue both mediated the effect of medical conditions on physical function (Bennett, 2002), but this relationship was not supported in this study. The limitations noted earlier about the validity of the comorbidity measure may have contributed to the failure to achieve a clinically important relationship between pain and comorbidity. Although post-hoc testing examining a correlation between pain and the modified version that included arthritis and other age-related comorbidities revealed a relationship that also did not reach the prescribed level of clinical importance.

The failure to observe a clinically important relationship between pain and BMI is especially surprising. A substantial portion of this sample was overweight or obese, and pathological factors believed to contribute to the development of FM (abnormal regulation of central pain mechanisms, abnormal HPA axis, excessive cortisol levels) are also associated with obesity (Okifuji, Bradshaw, & Olson, 2009). In a recent study of women with FM, BMI was negatively correlated with point tenderness threshold as measured with dolorimetry, and positively correlated with tender point count. Another study exploring relationships between BMI and measures of tenderness, physical functioning and quality of life in women living with FM found that obese women had higher pain sensitivity than those who were not obese (Neumann et al., 2008). Morbid obesity has also been implicated as a risk factor for transitioning from chronic low back or neck pain to widespread pain (Kindler, 2009). Researchers exploring the effect of behavioral weight loss treatment on symptoms in overweight women diagnosed with FM found that weight loss significantly improved their pain and other symptoms (Shapiro, Anderson, & Danoff-Burg, 2005). It is not clear why the relationship between pain and

BMI was not strong enough to achieve clinical importance in this sample. It is possible that the skewed distribution of BMI scores towards higher levels may have limited the ability to adequately assess the strength of these relationships.

Despite evidence of a relationship between tangible social support and chronic pain in older adults, no significant relationship between tangible social support and pain level was observed in this study. Although other studies have not examined the relationship between tangible social support and FM pain level, the relationship between FM pain and other kinds of social support has been studied. Montoya et al (2004) explored the influence of social support (spouse's presence) on pain processing and found that persons with FM reported less experimental pain and diminished tender point sensitivity when spouses were present. Holtzman and DeLongis (2007) also found that satisfaction with spousal support attenuated the relationship between pain and catastrophization in persons with RA. In a study of persons with chronic pain (20% with FM), Lopez-Martinez et al. (2008) found a weak but significant relationship between perceived support (affective and confidant) and pain. Weinberger et al. (1990) found that more arthritis pain was reported by those with low levels of tangible social support, but tangible social support was not a significant predictor of pain in a regression analysis. Although there was no significant correlation between tangible social support and pain in this study, it is possible that other dimensions of social support may influence the level of pain in persons with FM. Alternatively, the relatively high levels of support observed in this sample, along with corrections made to the significance level to account for multiple comparisons, may have limited the ability to detect a significant relationship.

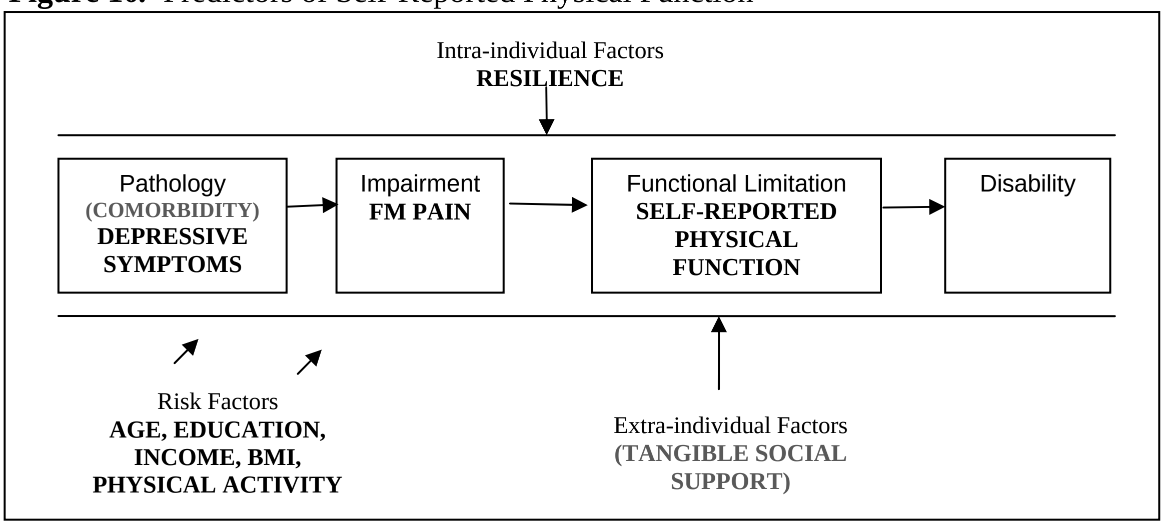
Pain level was also not related to physical activity in this sample. This finding was not surprising given that, overall, the level of activity was low. Increased pain has been reported after physical activity that involved exercise training at levels much higher than what were observed in this sample (Busch et al., 2007). That said, it does appear that pain levels can influence physical activity. Kop et al. (Kop et al., 2005) examined associations between objective ambulatory activity levels (using actigraph accelerometer) and both physical function and symptoms over a 5 day period in persons with FM and Chronic Fatigue Syndrome, and compared the results with age-matched controls. Activity counts were continuously recorded and summed at 5-minute epochs. Peak and average activity levels were calculated for each day of the 5-day period and also within four time periods of each day. They observed significantly lower peak activity levels in the patient group but no significant differences in average activity levels. They also reported weak but statistically significant correlations between activity levels and pain in the middle of the day and late afternoon. Further analysis revealed the essential finding that pain was correlated with activity that followed the pain report, but activity did not predict subsequent pain. The use of retrospective self-report measures in the current study may, therefore, have limited the ability to detect a relationship between pain and physical activity that has been observed when using objective measures as in the Kop et al. (2005) study.

Predictors of Physical Function

Relationships between self-reported physical function and the other variables in the model were examined in the second and third aims of the study. The relationship between physical function and FM impact was examined as a correlation, but FM impact was not included in the multiple regression analysis because of shared variance with other predictors that were being studied. However, it is important to note that the strongest correlation observed in the study was between FM impact, as measured by the FIQR, and physical function. The size of the correlation may have been inflated due to the shared dimension of physical function in both measures. Even so, this is an important finding in this study of older adults and consistent with what has been reported in all age groups with FM—the presence of FM increased the risk of functional limitations (Jones et al., 2008; Mease et al., 2007; Mease et al., 2008).

All but two of the two of the hypothesized demographic and health-related variables were identified as significant predicators of physical function and these variables altogether accounted for 32% of the variance in physical function (Figure 10).

Figure 10. Predictors of Self-Reported Physical Function



As hypothesized, increased age and higher levels of depressive symptoms and BMI, along with low levels of education, income, and physical activity predicted difficulties in physical function in this sample. However, the extra-individual factor of tangible social support was not a significant predictor of physical function, despite evidence of a positive relationship to physical function in older adults without FM. As mentioned earlier, it is possible that the relatively high levels of tangible social support in this sample limited the ability to detect a significant relationship, or perhaps other dimensions of social support are more important to older adults with FM than tangible social support.

Surprisingly, comorbidity, an important element of the Disablement Process, also was not identified as a significant predictor of physical function in older adults with FM. This was an unexpected finding, given the substantial evidence that physical function is particularly sensitive to comorbidity in older adults without FM (Femia et al., 2001; Fried & Guralnik, 1997; Guralnik et al., 1993; Miller et al., 2004). As noted earlier, it is possible that the low levels of comorbidity and lack of gender diversity in the sample (94% female) may have limited the ability to detect a statistically significant relationship between comorbidity and physical function in this study. FM is associated with multiple comorbidities and symptoms that can negatively affect physical function (Abeles et al., 2007; Katz et al., 2006; Mease et al., 2007). Alternatively, persons with FM may have a different experience with comorbidity that is not adequately assessed with traditional measures or perhaps comorbidity is simply not a significant risk factor for functional impairment in older adults with FM. Further research is needed to determine why this was not a significant predictor of physical function in this population.

The demographic (income, education, and age) and health-related risk factors (BMI, physical activity) were all significant predictors of physical function. In this study, persons who had low levels of income and education, advanced age, high BMI and low levels of physical activity had a higher risk of functional problems. It is important for nurses to assess the presence of these risk factors, especially high BMI and low levels of physical activity, and plan interventions that reduce BMI and motivate older adults with FM to engage in physical activity and/or exercise programs. This is particularly important for persons with advanced age because age is a risk factor that cannot be reduced. Fortunately, even low levels of physical activity can slow the loss of physical function in older adults (Miller, Rejeski, Reboussin, Ten Have, & Ettinger, 2000b).

The benefits of weight loss mentioned earlier in relationship to pain apply in this situation as well. A pilot study of overweight and obese women demonstrated that weight loss reduced not only pain but also pain-related impairments (Shaver et al., 2006). Further, there is a growing body of evidence that exercise enhances physical function in persons living with FM (Busch et al., 2007). Recently, Rooks et al. (2007) randomly assigned women with FM to one of four different groups (aerobic exercise, strength training, education, and a combination of strength training and education) designed to engage participants in 16 weeks of physical activity, or education, or both. Persons in the exercise groups all demonstrated improvements in the physical function measures, and the greatest improvement was observed in the group that combined education with exercise. Such findings are consistent with what was observed in this study about the benefits of increased education and physical activity, and underscore the protective influence of education and exercise on physical function in persons with FM.

Depressive symptoms contributed the largest amount to the variance in physical function in the analysis, highlighting the importance of assessing and managing these symptoms to reduce the impact on physical function.

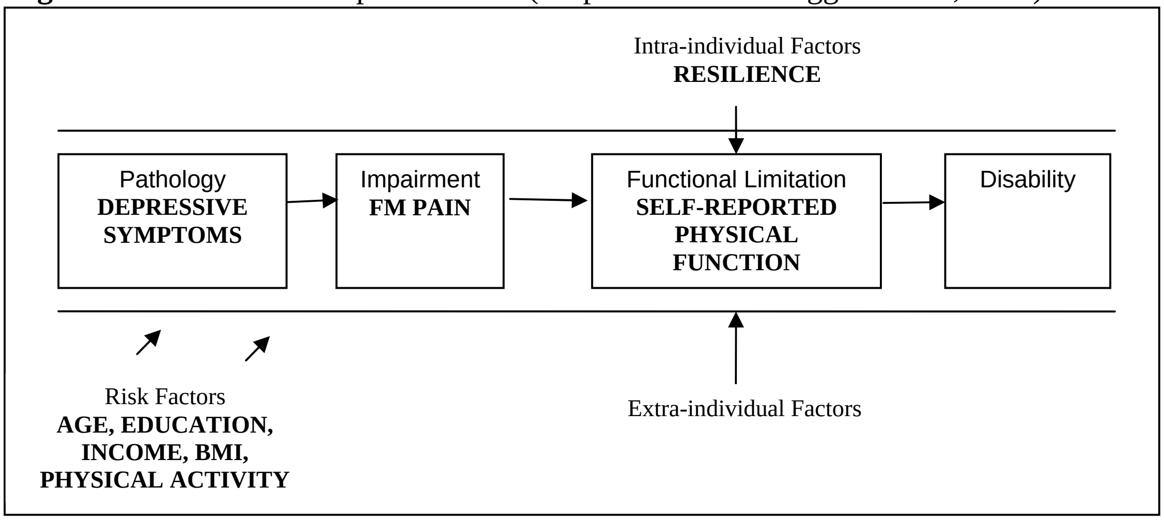
Resilience as a moderator

In order to examine the contribution of pain, resilience, and a potential interaction between them to the variance in physical function, a hierarchical regression analysis was conducted. Almost half (48%) of the variance in physical function was accounted for in the final model that included the predictors from the previous aim, pain and resilience. The predictors identified in the second aim accounted for a third (30%) of the variance in physical function while pain and resilience accounted for an additional 15% and 3%, respectively. The interaction term (pain x resilience) was not significant, which meant that resilience did not moderate the relationship between pain and physical function in this sample. Rather, resilience was a unique predictor of physical function. Low levels of resilience increased the risk of functional impairment whereas high levels of resilience protected physical function.

The findings for the third aim of this study have, for the most part, been consistent with the conceptual framework that guided the study. The key relationships identified in the model that were examined in this study were 1) hypothesized predictors of physical function, and 2) the moderating effect of resilience on pain and physical function. Figure 8 portrays the changes in the model that reflect the findings from the third aim and final aim of the study.

All but two of the theorized predictors of physical function remain in the model (Figure 11). Comorbidity and tangible social support have been removed from the model because they were not significant predictors of physical function. Resilience, originally positioned as a moderator between pain and physical function, was positioned above physical function to demonstrate the direct and unique relationship with physical function that was observed in this study. The remainder of the elements in the model reflects the biopsychosocial factors examined in this study that can affect physical function in persons with FM.

Figure 11. Revised Conceptual Model (adapted from Verbrugge & Jette, 1994)



Strengths and Limitations to the Study

There were several strengths and limitations to the study. One of the major strengths was the use of a conceptual framework to guide the study of hypothetical relationships among the variables. The Disablement Process was developed to guide the exploration of hypothesized elements of a disability pathway and the relationships between these elements. There is a substantial body of research that has used this model to explore the elements of the Disablement Process and this research has also contributed to it. Additionally, recruiting potential participants from an OHSU patient database ensured that participants had been classified with FM using the 1990 ACR criteria which significantly strengthened this study of older adults with FM. Lastly, the use of valid and reliable measures to operationalize the concepts examined in the study was a strength, enhancing the ability to compare findings from this study to others that have used these instruments in similar populations, and contributing to the evidence of validity and reliability when used with older adults living with FM.

It is important to also note that there were also several significant limitations that prevent generalization of these findings to other populations. The cross-sectional design prevented examination of temporal/causal relationships between the variables. Resilience, physical function and FM pain are complex, multidimensional phenomena, influenced by many confounding variables all of which were not measured or controlled in these studies. While the validity of self-report measures of pain quality, location, duration, and intensity is accepted, self-report measures of physical function have sometimes overestimated ability and correlation with observed measures has been inconsistent (Reuben et al., 2004b; Scudds & Robertson, 2000). Self-reported physical function reflects the person's perception of their physical function which may be different from their actual, observed level of physical function (Seeman et al., 1999). There is also a possibility that pain levels were under-reported by persons who believe that pain is an expected consequence of aging or believe that 'good patients' do not complain about pain.

Variance in the relationship between FM pain, its impact, and self-reported physical function may have also been affected by response shift in persons living with chronic pain. Response shift reflects a change in a person's "internal standards, values or conceptualizations of quality of life" as a result of changes in health (Schwartz et al., 2006, p. 1534). Because physical function is associated with health-related quality of life in older adults (Bryant et al., 2000; Bryant et al., 2001), it is possible that response shift due to chronic pain may also influence the relationship between FM pain and self-reported physical function.

Failure to use a randomly selected sample raises the risk of selection bias and limited the ability to generalize the findings beyond the participants in the study. The lack of ethnic diversity in a homogenous convenience sample can also be a significant limitation for researchers working with an increasingly diverse aging population. The potential for volunteer bias (persons with pre-conceived notions about these variables volunteering to participate) in a convenience sample was high, which also significantly limited these findings.

Clinical Implications

The results of this study can be used to enhance nursing knowledge about physical function risk and protective factors in older adults living with FM. Physical function is an important element of health in older adults, and it is essential that nurses working with older adults with FM assess not only the person's physical function, but also the presence of the risk and protective factors identified in this study. This will significantly enhance the nurse's ability to plan and provide care that promotes healthy aging in older adults living with FM. For example, if the nurse is working with an older person with FM to maintain or promote physical function, it is important to assess not only the person's physical function, but also the person's level of physical activity, pain, depressive symptoms, BMI, and resilience. Low levels of physical activity and resilience as well as higher levels of pain, depressive symptoms and BMI increase the risk of functional problems in older adults with FM.

To ensure adequate assessment of these risk factors, valid and reliable measures of each should be incorporated into clinical assessment tools. The FIQR is an excellent measure that incorporates assessment of physical function, FM symptoms (including pain and depression) and overall FM impact. Supplementing the FIQR with the shortened version of the Resilience Scale, and a shortened measure of physical activity would provide the nurse with important information that can be used to plan and evaluate interventions designed to restore or protect physical function. This study also raises awareness of the need for nurses to know how to effectively assess and manage pain, reduce depressive symptoms, cultivate resilience and motivate persons to reduce weight and engage in moderate levels of physical activity to protect physical function.

The finding that resilience has an independent effect on physical function (despite the presence of pain) has important clinical implications. Although there was a correlation between pain and resilience, there was no interaction between these two variables that could influence either variable's individual effect on physical function. That is, the impact of pain on physical function is not affected—does not increase or decrease—based on a person's level of resilience. This finding highlights the importance of resilience as an independent predictor of physical function and the need for nurses to know how to strengthen resilience in their patients.

Areas of Future Research

Further research is needed to continue to develop knowledge about physical function, pain and resilience in older persons living with FM. It is especially important to identify and test strategies designed to cultivate resilience in this population. A qualitative study designed to explore the lived experience of older adults living with FM who have a high level of resilience would be an important first step in this process. Randomized controlled trials designed to test strategies for cultivating resilience in persons with FM are also needed.

Temporal effects on levels of pain, resilience, physical function, symptoms and

FM impact in older adults were not examined in this study, so research designed to examine these variable over time in a longitudinal study is needed. A secondary analysis examining differences between age groups in each of these variables could also be conducted.

Quite a bit about the relationships between resilience, pain, and theorized predictors of physical function was learned from this study. Future research should also explore the relationships between resilience, symptoms of FM, and FM impact. The possibility of interactions (mediating or moderating) between resilience and other FM symptoms besides pain, and their effect on physical function should be explored.

Tangible social support was not a significant predictor of physical function in this study, and future research should be conducted to examine if other dimensions of social support predict physical function in older adults with FM. This study also highlighted the limitations of the Charlson Comorbidity Index—a valid and reliable measure of comordidity associated with increased risk of death—when used in a sample of older adults with FM that was predominantly female. Future research is needed to develop a valid and reliable measure of comorbidity in persons with FM, one that assesses the risk of disability, as well as death, due to comorbidity.

Summary

The purpose of this study was twofold: 1) explore the relationships between physical function, pain, and resilience in community dwelling older adults living with FM, and 2) examine the influence of resilience on the relationship between FM pain and self-reported physical function. The results of this study revealed that older adults with FM had moderately high levels of resilience despite moderate to severe levels of pain and impaired physical function, and resilience may help to explain why some older adults with FM report less impact than do younger persons with FM. Resilience was not found to moderate the impact of pain on physical function; high levels of resilience and low levels of pain were both independent predictors of higher levels of physical function in older adults with FM. Thus, older persons with FM who are at most risk for poor physical function are those with limited resilience and high levels of pain.

Physical function is closely associated with the experience of health in older adults and it is important for nurses to know how to protect patients from factors that threaten physical function as well as promote those that enhance it. The results of this study will hopefully inspire further research of interventions designed to reduce the risk of disability and promote health and quality of life in a growing number of older adults living with persistent and painful conditions like FM.

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List of Appendices

Appendix A
Summary of Studies

Table A1. Age and Self-Reported Physical Function (PF)

Author	Design **# Subjects** **Mean Age**	Instrument	PF Dimension OM=Obj. Mobility SRPF=Self-Report PF PL=Participate in Life Activities	Findings
Guralnik, JM, LaCroix, AZ, Abbott, RD, Berkman, LF, Satterfield, S, Evans, DA, Wallace, RB (1993).	Exploratory longitudinal (6 year) study with annual assessments 3 sites N = 6,981 mobile at baseline $\bar{X}$ =73.1 yr at baseline (range 65-103 yr)	Modified Rosow-Breslau Functional Health Scale—ability to walk ½ mile, climb up and down stairs	self-reported mobility (SRPF)	55.1% maintained mobility 36.2% lost mobility 8.7% death with no loss of mobility prior to death 17.8% regained mobility after loss RR(age) ranged 1.7-2.5* (twofold increase in mobility loss for each 10-yr increase in age
Gill, TM, Allore, HG, Hardy, SE, Guo, Z (2006)	Exploratory longitudinal (5 year) study with monthly assessments of mobility disability N=754 $\bar{X}$ =78.4 (SD=5.3)	Ability to walk ¼ mile, climb flight of stairs unassisted during 6 or more consecutive months.	mobility disability (SRPF) -No disability -intermittent disability (absence of 'no disability' or 'continuous disability') --continuous disability	Transition Rates (person-months) Decline: No disability to intermittent=34.7 Intermittent to continuous=52.0 Recovery: Intermittent to no disability=68.6 Continuous to intermittent= 35.4 Older age associated with greater likelihood of transitioning to disability and less likelihood of recovery
Lawrence, RH & Jette, AM (1996).	Exploratory longitudinal (6 year) study with assessments in 1984, 1988, 1990	Difficulty (y/n) with Upper extremity function (3 items) and Lower body	Functional Limitations (upper and lower body extremity) (SRPF)	Correlation with baseline age: Subsample 1 upper r=.116*§ lower r=.172*§ Subsample 2

Author	Design **# Subjects** **Mean Age**	Instrument	**PF Dimension** OM=Obj. Mobility SRPF=Self-Report PF PL=Participate in Life Activities	Findings
	N=1048 (split into 2 subsamples) $\overline{X}$ =74.18, (SD= 3.73)	function (5 items)		upper r=.085*§ lower r=.143*§
Miller, RR, Zhang, Y, Silliman, RA, Hayes, MK, Leveille, SG, Murabito, JM, Kiel, D, O'Connor, GT, Felson, DT (2004)	Exploratory longitudinal (10 yr) study with biennial assessments Baseline Exam 18: N=1825 $\overline{X}$ =73.5 yr (SD=6.7) Exam 23: N=1026 $\overline{X}$ =71.1 yr (SD=5.1)	Rosow-Breslau items—ability to walk up & down stairs, do heavy housework, walk ½ mile	functional limitation (SRPF) -no limitation -limitation if cannot perform without assistance -recovery indicated if FL previously reported no longer exists	Prevalence of difficulty with Self-Reported Physical Function increased over 10 year period 3.1% to 29.8% at baseline, 15.1% to 34% at end of study
Shumway-Cook, A, Ciol, MA, Yorkston, KM, Hoffman, JM, Chan, L (2005)	Exploratory cross-sectional study N=12,769 No limitation $\overline{X}$ =73.8yr (CI=73.6-74) Mild $\overline{X}$ =75.9yr (CI 75.7-76.1) Moderate $\overline{X}$ =78..9 (CI 78.5-79.3) Severe $\overline{X}$ =79.5 yr (CI=78.8-80.3) Non-walkers $\overline{X}$ =78.9 yr (CI=77.7-80.1)	Walking Mobility, walking ¼ mile	Walking Mobility (SRPF) -No limitation -Mild (difficulty but does not need help) -Moderate (difficulty, uses equipment only) -Severe (difficulty, uses personal assistance)	No limitations 53% Mild 31% Moderate 11% Severe 4% Non walkers 1% Difficulty r/t Age: OR=1.08*** No difficulty: $\overline{X}$ =73.8 yr Mild: $\overline{X}$ =75.8 yr Moderate: $\overline{X}$ =78.9 yr Severe: $\overline{X}$ =79.5 yr

p<.05*; p<.01**; p<.001***; §=standardized coefficient

Table A2. Gender and Self-Reported Physical Function (PF)

Author	**Design** **# Subjects** **Mean Age**	**Instrument**	**PF Dimension** OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	**Findings**
Lawrence, RH & Jette, AM (1996).	Exploratory longitudinal (6 year) study with assessments in 1984, 1988, 1990 N=7527 (split into 2 subsamples) $\overline{X}$ =74.18, (SD= 3.73)	Difficulty (y/n) with Upper extremity function (3 items) and Lower body function (5 items)	Functional Limitations (upper and lower body extremity) (SRPF)	Correlation with baseline age: Subsample 1 upper r=.116*§ lower r=.172*§ Subsample 2 upper r=.085*§ lower r=.143*§
Merrill, SS, Seeman, TE, Kasl, SV, Berkman, LF (1997)	Exploratory cross-sectional study N=1458 age≥71		Balance, Walk 8', Chair rise, Rotate shoulders (OM) (SRPF)Ability to: -do heavy housework -walk up an down stairs -walk ½ mile without help -push or pull an object -carry 10 pounds -raise arm above shoulders -write or handle small objects -stoop -crouch -kneel	'Unable' in one or more gross mobility items (housework, walk ½ mile, climb stairs) women 58.7%*** men 41.3%
Murtaugh, KN & Hubert, HB (2004)	Exploratory cross-sectional study N=1348 $\overline{X}_{age}$=79 range=73-99	Health Assessment Questionnaire (ADL,IADL, mobility)	Mobility (SRPF) -arising, walking ADL/IADL (PL)	Overall Functional Limitations: Women 52%*** Men 37% Walking Limitations: Women = 27.3 %*** Men =18.6 % Arising limitations Women =27.6 %*** Men =19.2%

p<.05*; p<.01**; p<.001***; §=standardized coefficient

Table A3. Tangible Social Support and Self-Reported Physical Function

Author	Design # Subjects Mean Age	Instrument	PF Dimension OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	Findings
DesMeules, M, Turner, L, Cho, R (2004)	Exploratory Cross-sectional prevalence study N=125,574	Canadian Community Health Survey	SRPF=limitation in activities SS=tangible SS	Disabled women have higher proportion of pain-related disability and lower levels of tangible social support
Meana, M, Cho, R, DesMeules, M (2004)	Exploratory Cross-sectional prevalence study N=125,574	Canadian Community Health Survey	SRPF=limitation in activities SS=tangible SS	Chronic pain more prevalent in persons with low tangible support
Neugebauer, A & Katz, PP (2004)	Longitudinal study N=404, RA patients $\overline{X}_{age}$=60.75, SD= 12.69 yr 81% female	Instrumental support-4 levels Valued life activity disability GDS-15	VLA Disability	Tangible SS *r*=-.21, p<.001
Osburne, TL, Jensen, MP, Ehde, DM, Hanley, MA, Kraft, G (2007)	Exploratory cross-sectional study N=125 persons with MS 75% female $\overline{X}_{age}$=50.74 yr (SD=10.77)	Expanded Disability Status Scale Pain Intensity NRS 0-10 BPI pain interference scale MOS-MH scale Chronic Pain Coping Inventory Catastrophizing scale of Coping	BPI Interference	As perceived social support increased, pain interference decreased (*r*=-.30, p<.01)

Author	**Design** **# Subjects** **Mean Age**	**Instrument**	**PF Dimension** OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	**Findings**
		Strategies Questionnaire Multidimensional scale of perceived social support		
Weinberger, M, Tierney, WM, Booher, P, Hiner, SL (1990)	Exploratory Cross-sectional study N = 439 persons with OA 88% female $\overline{X}_{age}$=62.3 yr (SD=11.6)	Interpersonal Support Evaluation List (ISEL) AIMS Hassles Scale	AIMS	Tangible SS (*r* = .21, p<.001) Tangible SS was unique predictor of physical function (b=-1.62 $\pm$ 0.74, p<.05)

p<.05*; p<.01**; p<.001***; §=standardized coefficient

Table A4. Comorbidity and Self-Reported Physical Function

Author	Design **# Subjects** **Mean Age**	Instrument	PF Dimension OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	Findings
Guralnik, JM, LaCroix, AZ, Abbott, RD, Berkman, LF, Satterfield, S, Evans, DA, Wallace, RB (1993).	Exploratory longitudinal (6 year) study with annual assessments 3 sites N = 6,981 mobile at baseline $\overline{X}$ =73.1 yr at baseline (range 65-103 yr)	Modified Rosow-Breslau Functional Health Scale—ability to walk ½ mile, climb up and down stairs	self-reported mobility (SRPF)	RR(loss of mobility) compared to persons with no disease at baseline 1 disease at baseline RR=1.4* 2 diseases at baseline RR=1.7* 3 diseases at baseline RR= 2.5* $\geq$4 diseases at baseline RR=2.9*
Miller, RR, Zhang, Y, Silliman, RA, Hayes, MK, Leveille, SG, Murabito, JM, Kiel, D, O'Connor, GT, Felson, DT (2004)	Exploratory longitudinal (10 yr) study with biennial assessments Baseline Exam 18: N=1825 $\overline{X}$ =73.5 yr (SD=6.7) Exam 23: N=1026 $\overline{X}$ =71.1 yr (SD=5.1)	Rosow-Breslau items—ability to walk up & down stairs, do heavy housework, walk ½ mile	functional limitation (SRPF) -no limitation -limitation if cannot perform without assistance -recovery indicated if FL previously reported no longer exists	Prevalence of difficulty with Self-Reported Physical Function increased over 10 year period 3.1% to 29.8% at baseline, 15.1% to 34% at end of study RR (recovery): $\geq$3 conditions Housework: RR=0.1*** Climbing stairs: RR=0.5*** Walking ½ mile: RR=0.1*

p<.05*; p<.01**; p<.001***; §=standardized coefficient

Table A5. Depressive Symptoms and Self-Reported Physical Function

Author	**Design** **# Subjects** **Mean Age**	**Instrument**	**PF Dimension** OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	**Findings**
Cronin-Stubbs, D, Mendes de Leon, CF, Beckett, LA, Field, TS, Glynn, RJ, Evans, DA (2000)	Longitudinal population-based study N=3434 older adults $\overline{X}_{age}$=73.2 (SD=6.38) yr 63% female	CES-D 10 item Katz ADL Rosow-Breslau Functional Health Scale Nagi Index	ADL, mobility, LE strength	Potential for disability increased with each depressive symptom (OR = 1.16 per symptom. 96% CI, 1.13-1.19)
Penninx, BWJH, Guralnik, JM, Ferrucci, L, Simonsick, EM, Deeg, DJH, Wallace, RB (1998)	Exploratory, longitudinal study	CES-D 2.4 m walk Chair raises	Objective mobility	Increasing levels of depressive symptoms predicted greater decline in physical performance (OR=1.55, 95% CI 1.02-2.34)

p<.05*; p<.01**; p<.001***; §=standardized coefficient

Table A6. BMI and Self-Reported Physical Function

Author	**Design** **# Subjects** **Mean Age**	**Instrument**	**PF Dimension** OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	**Findings**
Janssen, I, Heymsfield, SB, Ross, R (2002).	Exploratory cross-sectional survey N=4505 ≥60yrs	Rosow-Breslau items	(SRPF) -walking ¼ mile -climbing 10 stairs -carrying 10# -Stooping -Crouching -Kneeling -Standing up from chair	Class II Sarcopenia OR of difficulty with: walking ¼ mile RR=1.81* climbing stairs RR=2.02* Carrying 10# RR=2.58* stoop/crouch/kneel RR=3.96* Stand up from chair RR=2.02*
Larrieu, S, Peres, K, Letenneur, L, Dartigues, JF, Ritchie, K, Alperovitch, A, Barberger-Gateau, P (2004)	Exploratory cross-sectional study N=8966 $\overline{X}$ =74.2 yr (SD=5.6)	Rosow Breslau items	(SRPF) -heavy housework -walking ½ mile -climbing stairs	OR mobility disability Men BMI [30-35] RR=1.6*** BMI>35 RR=3.2*** Women BMI [30-35] RR=1.6*** BMI>35 RR=3.4***

p<.05*; p<.01**; p<.001***; §=standardized coefficient

Table A7. Physical Activity and Self-Reported Physical Function

Author	Design \# Subjects Mean Age	Instrument	PF Dimension OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	Findings
LaCroix, AZ, Guralnik, JM, Berkman, LF, Wallace, RB, Satterfield, S (1993).	Exploratory longitudinal (6 year) study with annual assessments 3 sites N = 6,981 mobile at baseline $\overline{X}$ =73.1 yr at baseline (range 65-103 yr)	Modified Rosow-Breslau Functional Health Scale—ability to walk ½ mile, climb up and down stairs	self-reported mobility (SRPF)	Risk of mobility loss High physical activity RR=.6*
McAuley, E, Konopack, JF, Morris, KS, Motl, RW, Hu, L, Doerksen, SE, Rosengren, K (2006)	Exploratory cross-sectional study N=249 women $\overline{X}$ =68.2 yr range 59-84 yr	Self-Reported Physical Function: Late Life Function and Disability Index-Function component (FDI)	(SRPF) -Advanced Lower Extremity Function (ALEF) -Basic Lower Extremity Function (BLEF)	Correlation with CHAMPS: ALEF r=.33** BLEF r=.19** PASE: ALEF r=.40** BLEF r=.20**
Miller, ME, Rejeski, WJ, Reboussin, BA, Ten Have, TR, Ettinger, WH (2000).	Exploratory longitudinal 6 year study with biennial assessments N=5151 Baseline $\overline{X}$ =78.2 yr (SD=6.0)	Wolinsky & Johnson Lower body limitation scale (4/10 items)	(SRPF) -walk ¼ mile -climb 10 steps -stand 2 hours -stoop/crouch or kneel	Physically active at baseline: Severe limitations vs moderate or none 1986 RR=.45* 1988 RR=.47* 1990 RR=.74*

p<.05*; p<.01**; p<.001***; §=standardized coefficient

Table A8. Pain and Self-Reported Physical Function

Author	Design # Subjects Mean Age	Instrument	PF Dimension OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	Findings
Lichtenstein, MJ, Dhanda, R., Cornell, JE, Escalante, A, Hazuda, HP (1998)	Exploratory cross-sectional study N=811 Mexican American $\overline{X}$ = 68.6 yr (SD=3.1) European American $\overline{X}$ =69.6 yr (SD=3.4)	McGill Pain Questionnaire (frequency-pain in past week, intensity-pain rating index) McGill Pain Map (location-36 areas)	(SRPF) Nagi Scale: -lower extremity (stooping/crouching/kneeling, getting up, stand on one foot, stand in place) & -upper extremity (pushing/pulling, lifting 10#, writing, picking up object with one hand)	Pain: 46% (n=373) Functional Score $\overline{X}$ =2.43/9 no pain $\overline{X}$ =4.30/9 pain 23% knees 20% low back 19.6% right shoulder 18.2% upper back 17.2% left shoulder 16.6% right leg 54.7% upper leg region frequency, intensity, location were independent of each other Pain dimensions accounted for 20% of variance in functioning. Location-Upper leg pain associated with 8/9 functioning tasks 9-12% of variance in functioning scores Intensity associated with 8/9 functioning tasks Dose-response relationship between intensity and composite function scores 5-6% of variance in functioning scores
Scudds, RJ & Ostbye, T (2001)	Exploratory cross-sectional study N=5700 70-90 yr	MOS SF-12 Pain items -pain in last 4 weeks that lasted one day or longer -pain	Moving about (SRPF) Normal Tasks (PL)	Mod/Severe Pain & Interference with moving about (difficulty moving): Moderately: 44.8% A little : 23.6% Not at all: 31%

Author	**Design** **# Subjects** **Mean Age**	**Instrument**	**PF Dimension** OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	**Findings**
	59% female	interferes with: moving, tasks, recreation,, sleep, mood, enjoyment of life		Mod/Severe Pain & Interference with normal tasks: Moderately: 39.7% A little: 23.8% Not at all: 36.5%
Thomas, E, Peat, G, Harris, L, Wiilkie, R, Croft, P (2004)	Exploratory cross-sectional study N=7,878 Age≥ 50 yr 56% female	MOS SF-12 Pain items -pain in last 4 weeks that lasted one day or longer -pain map (44 areas) -impact on work (in and out of home)	(PL) Pain interference with work	Pain Prevalence 66.2% Pain prevalence by region declined with age in all areas but lower limb Pain Interference 38.1% (in those with pain 58.7%), rises with age (50% in 80+yr) Median number of pain areas or prevalence of multiple pain sites did not increase with age
Thomas, E, Mottram, S, Peat, G, Wilkie, R, Croft, P (2006)	Exploratory longitudinal study N=4234 Age≥ 50 yr 55% female	MOS SF-12 Pain items -pain in last 4 weeks that lasted one day or longer -impact on work (in and out of home)	(PL) Pain interference with work	No Pain Baseline: 48% reported new incidence @ 3yr 19% reported interference (34% of persons over 80yr, $\chi 2$=27.2, p<0.001) Pain at Baseline: 86% reported pain persistence @ 3yr 72% reported persistence of pain interference (higher in females and those with advanced age, $\chi 2$=13, p=0.005) 23% reported worsening of pain interference

p<.05*; p<.01**; p<.001***

Table A9. Age and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Bowen, DJ, Morasca, AA, Meischke, H. (2003).	Exploratory Longitudinal Design Multiple Regression	Seattle, WA N=357 women Avg age=42.4 yr (SD=8)	Investigator developed resilience measure: summed score of Life Orientation Test-revised; Life ladder scale; Life Attitude Profile-Revised	Predictors (B values): Age (.92)**
Nygren, B., Alex, L., Jonsen, E., Gustafson, Y., Norberg, A., Lundman, B. (2005).	Exploratory Cross-sectional Survey	Northern Sweden N=125 69% women All were $\geq$85 yr	Resilience Scale-Swedish Version	Mean RS score was higher with persons >85 yrs than RS scores reported for younger age groups
Talsma AN (1995).	Exploratory Cross-sectional Survey Structural Equation Modeling	Northern Netherlands N= 4602 age $\bar{X}$ =69.6 yr (SD=7.9)	Physical Function—Groningen Activity Restriction Scale. Psychological Function— Mastery scale; Eysenck Personality Questionnaire-Revised; General self-efficacy scale. Well-Being— Cantril's ladder ; Seven Point Satisfaction Rating	Gamma coefficients Age (-.294)

$p<.05$*; $p<.01$**; $p<.001$***

Table A10. Gender and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Hardy, SF, Concato, J, Gill, TM (2004).	Exploratory Cross-sectional Design	New Haven, CT N=546 64% women age $\overline{X}$ =71 years	Resilience module of the Asset and Health Dynamics (AHEAD) study (based on Rowe et al, 1997)	Relative Risk: Male gender (1.39)*
Talsma AN (1995).	Exploratory Cross-sectional Survey Structural Equation Modeling	Northern Netherlands N= 4602 age $\overline{X}$ =69.6 yr (SD=7.9)	Physical Function--Groningen Activity Restriction Scale. Psychological Function—Mastery scale; Eysenck Personality Questionnaire-Revised; General self-efficacy scale. Well-Being—Cantril's ladder ; 7-Point Satisfaction Rating	Gamma coefficients Female gender (-.071)*

p<.05*; p<.01**; p<.001***

Table A11. Education and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Hardy, SF, Concato, J, Gill, TM (2004).	Exploratory Cross-sectional Design	New Haven, CT N=546 64% women age $\overline{X}$ =71 years	Resilience module of the Asset and Health Dynamics (AHEAD) study (based on Rowe et al, 1997)	Post-secondary education RR = 1.21 n/s
Karoly, P., Ruehlman, L.S. (2006).	Exploratory Cross-sectional Survey	N=544 43% women Age ranged from 25-80, 35% over age 65	Resilient group criteria: high pain + low interference Non-resilient criteria: low pain + low interference high pain + high interference	Resilient sample reported higher level of education χ^2=13.19**
Wagnild, GM, Young, HM (1993).	Exploratory Cross-sectional Survey	Northwest US N=810 62.3% women age $\overline{X}$ =71.1 yr (SD=6.5)	Resilience Scale	education reported as n/s

p<.05*; p<.01**; p<.001***

Table A12. Income and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Hardy, SF, Concato, J, Gill, TM (2004).	Exploratory Cross-sectional Design	New Haven, CT N=546 64% women age $\overline{X}$ =71 years	Resilience module of the Asset and Health Dynamics (AHEAD) study (based on Rowe et al, 1997)	Income n/s but linear trend noted that number of persons with income >$25,000/yr increased over levels of resilience (low to high)
Wagnild, GM, Young, HM (1993).	Exploratory Cross-sectional Survey	Northwest US N=810 62.3% women age $\overline{X}$ =71.1 yr (SD=6.5)	Resilience Scale	income n/s
Wagnild, G. (2003).	Secondary Analysis of Exploratory Cross-sectional Surveys (3)	High income: N=408 2 groups % women ranged 44-49% age $\overline{X}$ =69.1 to 69.5 yrs Low income: N=316 3 groups % women ranged 83-85% age $\overline{X}$ =73.4 to 74.9 yrs	Resilience Scale	Significant difference in resilience scores in one sample (N-344) High income=148.8/175** Low income=142.9/175

p<.05*; p<.01**; p<.001***

Table A13. Tangible Social Support and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Karoly, P., Ruehlman, L.S. (2006).	Exploratory Cross-sectional Survey Group differences	N=544 43% women Age ranged from 25-80, 35% over age 65	Resilient group criteria: high pain + low interference Non-resilient criteria: low pain + low interference high pain + high interference	Resilient sample reported less negative pain behaviors: Guarding***, pain-induced fear***, belief in a medical cure for their pain***, social hindrance*** (insensitivity and impatience) and self-ascribed disability*** Resilient sample reported more positive pain behaviors: Positive self-talk***, greater task persistence***, tangible (but not emotional) social support **

Table A14. Comorbidity and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Talsma AN (1995).	Exploratory Cross-sectional Survey Structural Equation Modeling	Northern Netherlands N= 4602 age $\overline{X}$ =69.6 yr (SD=7.9)	Physical Function--Groningen Activity Restriction Scale. Psychological Function—Mastery scale, Eysenck Personality Questionnaire-Revised; General self-efficacy scale. Well-Being—Cantril's ladder ; Seven Point Satisfaction Rating	Chronic illness Beta coefficient= -0.376*

p<.05*; p<.01**; p<.001***

Table A15. Depressive Symptoms and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Beutel, ME, Glaesmer, H, Decker, O, Fishchbeck, S, Brahler, E (2009)	Exploratory Cross-sectional design	Stratified random sample of German women (N=2540) age $\overline{X}$ =49.93 (SD=17.20) yrs	RS-14 Depression--2 items from Patient Health Questionnaire	Low resilience was a predictor of depression (β=-.07, p<.01)
Hardy, SF, Concato, J, Gill, TM (2004).	Exploratory Cross-sectional Design	New Haven, CT N=546 64% women age $\overline{X}$ =71 years	Resilience module of the Asset and Health Dynamics (AHEAD) study (based on Rowe et al, 1997)	Depressive symptoms independently related to high resilience (*RR*=1.59, 95% CI = 1.05-2.11)
Sinclair, V.G., & Watson, K.A. (2004).	Exploratory Cross-sectional Survey	Younger group: N=90 women with RA Age $\overline{X}$ =46 yr, SD=10.35) Older group: N= 140 persons with RA 73% women Age $\overline{X}$ =57.8 yr (SD=13.35)	Brief Resilience Coping Scale	Negative correlation between resilience and depression (*r*=-.30, p<.001)

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Smith, BW, Dalen, J, Wiggins, K, Tooley, E, Christopher, P, Bernard, J (2008)	Exploratory cross-sectional design	Sample 1 (undergrads) n=128 Sample 2 (undergrads) N=64 Sample (cardiac rehab pt) N=112 Sample 4 (control and FM) n=30 controls N=20 FM	Conor-Davis Resilience Scale Brief Resilience Scale Ego Resilience Scale Life Orientation Test-Revised Purpose in Life Toronto Alexithymia Scale Type D Personality Brief COPE ISEL MOS-SS Negative Social Interactions Brief Health-related Measures HADS Mental Health Inventory Mood Adjective Checklist Physical Symptoms Index Perceived Stress Scale PANAS	Correlation between depression and BRFS in FM group (r = -.66, p<.01)
Wagnild, GM, Young, HM (1993).	Exploratory Cross-sectional Survey	Northwest US N=810 62.3% women age $\overline{X}$ =71.1 yr (SD=6.5)	Resilience Scale Beck Depression Inventory	Correlation between depression and resilience (r = -.41, p<.001)

p<.05*; p<.01**; p<.001***

Table A16. Physical Activity and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Hardy, SF, Concato, J, Gill, TM (2004).	Exploratory Cross-sectional Design	New Haven, CT N=546 64% women age $\overline{X}$ =71 years	Resilience module of the Asset and Health Dynamics (AHEAD) study (based on Rowe et al, 1997)	Relative Risk: High grip strength (1.40)* IADL independence (1.54)*
Talsma AN (1995).	Exploratory Cross-sectional Survey Structural Equation Modeling	Northern Netherlands N= 4602 age $\overline{X}$ =69.6 yr (SD=7.9)	Physical Function--Groningen Activity Restriction Scale. Psychological Function—Mastery scale, Eysenck Personality Questionnaire-Revised; General self-efficacy scale. Well-Being—Cantril's ladder ; Seven Point Satisfaction Rating	Beta coefficients: Physical activity(.266)* Exercise (.170)*

p<.05*; p<.01**; p<.001***

Table A17. Self-Reported Physical Function and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Physical Function Dimensions Associated with Resilience
Berkman, LF, Seeman, TE, Albert, M, Blazer, D, Kahn, R, Mohs, R, Finch, C, Schneider, E, Cotman, C, McClearn, G, Nesselroade, J, Featherman, D, Garmezy, N, McKhann, G, Brim, G, Prager, D, Rowe, J (1993)	Exploratory cross-sectional study	3 EPESE programs High functioning N=1192 Medium functioning N=80 (matched with high functioning age/gender) Low functioning N=82 (matched with high functioning age/gender)	Resilience qualities: Hopkins' Symptom Checklist (depression, anxiety, interpersonal problems, somatization) Mastery scale (Pearlin) Self-efficacy scale (Rodin) Life Satisfaction Happiness Demands & latitudes in daily life	High functioning group scored higher on Efficacy** Mastery** Life Satisfaction** Self-rated health*** Volunteering (hr/yr)** High functioning group scored lower on Symptoms** Chronic conditions***
Hardy, SF, Concato, J, Gill, TM (2004).	Exploratory Cross-sectional Design	New Haven, CT N=546 64% women age $\overline{X}$ =71 years	Resilience module of the Asset and Health Dynamics (AHEAD) study (based on Rowe et al, 1997)	Objective Mobility: High grip strength RR=1.40* Participation in Life Activities: IADL independence RR=1.54*
Nygren, B., Alex, L., Jonsen, E., Gustafson, Y., Norberg, A., Lundman, B. (2005).	Exploratory Cross-sectional Survey	Northern Sweden N=125 69% women All were $\geq$85 yr	Resilience Scale-Swedish Version	Self-Reported Physical Function: SF-36 Physical Health n/s

$p<.05$*; $p<.01$**; $p<.001$***

Table A18. Pain and Resilience

Author	Design	Setting/Sample	Resilience Instrument	Factors Associated with Resilience
Karoly, P., Ruehlman, L.S. (2006).	Exploratory Cross-sectional Survey Group differences	N=544 43% women Age ranged from 25-80, 35% over age 65	Resilient group criteria: high pain + low interference Non-resilient criteria: low pain + low interference high pain + high interference	Resilient sample reported less negative pain behaviors: Guarding***, pain-induced fear***, belief in a medical cure for their pain***, social hindrance*** (insensitivity and impatience) and self-ascribed disability*** Resilient sample reported more positive pain behaviors: Positive self-talk***, greater task persistence***, tangible (but not emotional) social support **
Sinclair, V.G., & Watson, K.A. (2004).	Exploratory Cross-sectional Survey	Younger group: N=90 women with RA Age $\bar{X}$ =46 yr, SD=10.35) Older group: N= 140 persons with RA 73% women Age $\bar{X}$ =57.8 yr (SD=13.35)	Brief Resilience Coping Scale	Correlations in older group: <u>Personal coping resources</u> Helplessness r= -.32** Psychological vulnerability r= -.17** Dispositional optimism r= .41*** Perceived health competence r=.39** Self-efficacy—pain r=.18 Self-efficacy—arthritis sx r=.30*** <u>Pain coping behaviors:</u> reappraisal r= .56*** Active problem solving r= .40*** Seeking social support r= .23** Acceptance n/s Catastrophizing r= -.41*** Venting r= -.25**

p<.05*; p<.01**; p<.001***

Table A19. Moderators of Pain and Physical Function

Author	Design # Subjects Mean Age	Instruments	PF Dimension OM=Obj. Mobility SRPF=Self-Reported PF PL=Participate in Life Activities	Findings
Rejeski, WJ, Miller, ME, Foy, C, Messier, S, Rapp, S (2001)	Exploratory longitudinal study N=480 $\overline{X}$ =71.82 (SD=5)	Knee pain-walking, climbing, transferring, Likert 6 pt knee strength-isokinetic dynamometer Self –efficacy (task specific)	Stair climb task (OM) SR ADL, IADL (PL)	Predictors of 30 month change in disability strength b=.147* self-efficacy b=.006* strength x self-efficacy b=-.0017* Predictors of 30 month change in stair climb strength b=3.3152*** self-efficacy b=.142*** strength x self-efficacy b=-.3328***
Sinclair, VG, &Wallston, KA (2004)	Exploratory cross-sectional design N=140 $\overline{X}$ =57.8 yr (SD=13.35)	Brief Resilient Coping Scale CES-D-depression Visual Analog Pain Scale (AIMS)-pain in past month	n/a	Significant interaction term (pain x resilient coping) when depression scores were regressed on pain and depression scores. β= -0.19, t(121)= -2.23*

p<.05*; p<.01**; p<.001***;

Appendix B
Invitation Letter

Jane Doe
123 Oak Street
Portland, OR 97205

August xx, 2009

Dear Ms. Doe;

We are writing this letter because you have been seen as a patient at the OHSU fibromyalgia clinic or have expressed an interest in participating in our fibromyalgia research studies. We would like to invite you to participate in our latest research study, “The Influence of Resilience on the Relationship Between Fibromyalgia Pain and Physical Function in Middle-Aged and Older Adults.” The study will investigate the relationships between resilience (a person’s ability to recover from or adjust to stress), fibromyalgia pain and physical functioning. You will be asked to complete and return a questionnaire expected to take 30-45 minutes to complete that is included in this package.

To participate in this study you must have fibromyalgia, be over the age of 50, be English speaking, and have experienced pain over the last seven days. Both men and women are invited to participate. All personal identifying information will be removed from your questionnaire and your confidentiality will be maintained.

If you believe you qualify for the study, please take a few minutes to review the attached information sheet that describes in detail how to participate, and provides answers to questions you may have about benefits, risks and your rights as a participant in the study. If you agree with these terms, please complete the enclosed study questionnaire, and return it to us in the addressed, stamped return envelope included in this packet. If you would prefer to complete the questionnaire over the phone, we would be happy to call you for that purpose. When we review your questionnaire responses, we may have some questions about your responses. We would like permission, in that case, to contact you by phone to seek clarification.

Please accept the $2 enclosed in this letter as a token of our gratitude whether or not you decide to participate. If you choose not to participate, your relationship with our clinic and research center will not be affected in any way. If you have any questions regarding this study now or in the future, contact Linda Torma directly at (406) 360-6134 or through the Research Participant Toll Free Number (888-651-2136).

We thank you in advance for your cooperation in helping us learn more about how to best treat fibromyalgia.

Gail Houck, PhD, RN
Nurse Researcher

Linda Torma, MSN, APRN, GCNS-BC
OHSU PhD Candidate

eIRB #: 00005615

8/27/2009

Appendix C
Study Information

OREGON HEALTH & SCIENCE UNIVERSITY
Information Sheet

TITLE: The Influence of Resilience on the Relationship between Fibromyalgia Pain and Physical Function

PRINCIPAL INVESTIGATOR: Gail Houck, PhD, RN, PMHNP (503) 494-3825

CO-INVESTIGATORS: Linda M. Torma, MSN, RN (406) 360-6134
Kim Dupree Jones, PhD, FNP (503) 494-3837
Deborah Messecar, PhD, RN (503) 494-3573
Gail Wagnild, PhD, RN (406) 967-3067

STUDY CONTACT: Research Participant Toll Free Number (888) 651-2136

What is the purpose of this study?

You have been invited to be in this research study because you have been seen as a patient at the OHSU Fibromyalgia Clinic or you have expressed interest in participating in the clinic's fibromyalgia research studies. The purpose of this study is to learn more about the influence of resilience (a person's ability to recover from or adjust to stress)on the relationship between fibromyalgia pain and physical function in middle-aged and older adults. Two hundred people with fibromyalgia will be enrolled in the study at OHSU.

What is required to participate in this study?

To participate in this study you must have fibromyalgia, be over the age of 50, be English speaking, and have experienced pain over the last seven days.

What can I expect as a study participant?

This study consists of a one-time mailed survey that is sent to your home with an addressed, stamped return envelope. You will be asked to complete and return the survey, expected to take approximately 30-45 minutes to complete. There is no requirement to go to OHSU, as this study is to be completed through the mail, only. If you would like to participate, but would rather do the survey by phone, we would be happy to call you for that purpose.

When we review the survey answers you mail us, we may have some questions about your responses. We would like permission, in that case, to contact you by phone to seek clarification.

If you have any questions regarding this study now or in the future, contact Linda Torma, MSN, RN directly at (406) 360-6134 or through the Research Participant Toll Free Number (888-651-2136).

What effect will this study have on my clinical care?

Being in this study will not affect any care you might receive at OHSU.

What are the possible risks of participating in this study?

Some of the questionnaires may seem very personal or embarrassing. They may upset you. You may refuse to answer any of the questions that you do not wish to answer.

What are the possible benefits of participating in this study?

You may or may not personally benefit from being in this study. However, by serving as a subject, you may help us learn how to benefit patients in the future.

Will it cost me anything to participate?

There are no costs associated with this study. You will receive $2 as a token of our appreciation, whether or not you decide to participate in the study.

How will my privacy be protected?

The information you provide to us on the survey is the only information we will obtain in this study. We will keep it in a secured location to which only the researchers have access. We will have your name and contact information recorded until you have sent us the survey, we have reviewed it and we have called to clarify any responses, if necessary. Once we have recorded your information in our research data base, we will destroy your identifying information (like name, contact information) and store the study data without your identity. We will not use your name or any identifying information in publications or research presentations.

The persons who are authorized to use and disclose this information are all the investigators listed on page one of this Information Sheet, other OHSU staff who are participating in the conduct of this study, and the OHSU Institutional Review Board.

The persons who are authorized to receive this information are the Office for Human Research Protections (OHRP) and any federal or other governmental agencies as required for their research oversight.

We may continue to use and disclose protected health information that we collect from you in this study indefinitely.

What if I am harmed in this study?

If you believe you have been harmed in this study, contact Gail Houck, PhD, RN, PMHNP (503) 494-3825.

What are my rights as a participant?

If you have any questions regarding your rights as a research subject, you may contact the OHSU Research Integrity Office at (503) 494-7887.

You do not have to join this or any research study. If you do join, and later change your mind, you may quit at any time. If you refuse to join or withdraw early from the study, there will be no penalty or loss of any benefits to which you are otherwise entitled.

You have the right to revoke this authorization and can withdraw your permission for us to use your information for this research by sending a written request to the Principal Investigator listed on page one of the research consent form. If you do send a letter to the Principal Investigator, the use and disclosure of your protected health information will stop as of the date she receives your request. However, the Principal Investigator is allowed to use and disclose information collected before the date of the letter or collected in good faith before your letter arrives. Revoking this authorization will not affect your health care or your relationship with OHSU.

The participation of OHSU students or employees in OHSU research is voluntary and you are free to choose not to serve as a research subject in this protocol for any reason. If you do elect to participate in this study, you may withdraw from the study at any time without affecting your relationship with OHSU, the investigator, the investigator's department, or your grade in any course.

Appendix D
Study Questionnaire

Oregon Health & Science University

Resilience and Fibromyalgia Impact Study

Telephone Questionnaire

Thank you for agreeing to complete the questionnaire over the phone. The interview will take approximately one hour, maybe less. Before we begin the questionnaire, I would like to review the information sheet that was sent with the packet. [Review information sheet]. I also need your verbal consent to complete the questionnaire over the phone. Do you wish to participate in this study by completing the questionnaire over the phone? ___Yes ___No

If no:

Thank you for your time. I appreciate your willingness to consider participating in this study.

If yes:

The questionnaire has several parts to it. The first page contains your contact information. As mentioned in the information sheet, this page will be stored separately from the questionnaire to protect your identity.

Date: ___________________________

What is your full name: ____

What is your Phone number: (___)______________________

What is the best time to call? ______________________

What is your Mailing Address: ____

____

What is your Email Address: ____________________________________

For Internal Use Only

ID #___________

Date Mailed________________________

Date Received______________________

IRB #5615

The next section of the questionnaire focuses on fibromyalgia.

Directions: On a scale of 0 to 10, with 0 meaning no difficulty, and 10 very difficult, please tell me how much your fibromyalgia made it difficult to do each of the following activities **during the past 7 days**. If you can't perform an activity, please tell me that instead of rating the difficulty.

Brush or comb your hair	**No difficulty** □ □ □ □ □ □ □ □ □ □ □ **Very difficult** **Cannot do** □
Walk continuously for 20 minutes	**No difficulty** □ □ □ □ □ □ □ □ □ □ □ **Very difficult** **Cannot do** □
Prepare a homemade meal	**No difficulty** □ □ □ □ □ □ □ □ □ □ □ **Very difficult** **Cannot do** □
Vacuum, scrub or sweep floors	**No difficulty** □ □ □ □ □ □ □ □ □ □ □ **Very difficult** **Cannot do** □
Lift and carry a bag full of groceries	**No difficulty** □ □ □ □ □ □ □ □ □ □ □ **Very difficult** **Cannot do** □
Climb one flight of stairs	**No difficulty** □ □ □ □ □ □ □ □ □ □ □ **Very difficult** **Cannot do** □
Change bed sheets	**No difficulty** □ □ □ □ □ □ □ □ □ □ □ **Very difficult** **Cannot do** □
Sit in a chair for 45 minutes	**No difficulty** □ □ □ □ □ □ □ □ □ □ □ **Very difficult** **Cannot do** □
Go shopping for groceries	**No difficulty** □ □ □ □ □ □ □ □ □ □ □ **Very difficult** **Cannot do** □

Sub-total ***(for internal use only)***

Directions: On a scale of 0 to 10, with 0 meaning never and 10 meaning always please indicate the number that best describes the overall impact of your fibromyalgia **over the last 7 days**:

Fibromyalgia prevented me from accomplishing goals for the week	**Never** □ □ □ □ □ □ □ □ □ □ □ **Always**
I was completely overwhelmed by my fibromyalgia symptoms	**Never** □ □ □ □ □ □ □ □ □ □ □ **Always**

Sub-total ***(for internal use only)***

Please rate your level of pain	If 0 is and 10 is **No pain** □ □ □ □ □ □ □ □ □ □ □ **Unbearable pain**
Please rate your level of energy	If 0 is and 10 is **Lots of energy** □ □ □ □ □ □ □ □ □ □ □ **No energy**
Please rate your level of stiffness	If 0 is and 10 is **No stiffness** □ □ □ □ □ □ □ □ □ □ □ **Severe stiffness**
Please rate the quality of your sleep	If 0 is **Awoke well rested** and 10 is □ □ □ □ □ □ □ □ □ □ □ **Awoke very tired**
Please rate your level of depression	If 0 is and 10 is **No depression** □ □ □ □ □ □ □ □ □ □ □ **Very depressed**
Please rate your level of memory problems	If 0 is and 10 is **Good memory** □ □ □ □ □ □ □ □ □ □ □ **Very poor memory**
Please rate your level of anxiety	If 0 is and 10 is **Not anxious** □ □ □ □ □ □ □ □ □ □ □ **Very anxious**
Please rate your level of tenderness to touch	If 0 is and 10 is **No tenderness** □ □ □ □ □ □ □ □ □ □ □ **Very tender**
Please rate your level of balance problems	If 0 is and 10 is **No imbalance** □ □ □ □ □ □ □ □ □ □ □ **Severe imbalance**
Please rate your level of sensitivity to loud noises, bright lights, odors and cold	If 0 is and 10 is **No sensitivity** □ □ □ □ □ □ □ □ □ □ □ **Extreme sensitivity**

How long have you had FM symptoms: **Duration of FM symptoms (years) ______**

What year were you first diagnosed?_____ **Time since FM was first diagnosed (years): _____**

This portion of the questionnaire focuses on your medical history. I will be reading off a list of medical conditions. Please answer yes or no for each of the conditions.

<u>1. Myocardial infarction:</u>

Have you ever had a heart attack?	No _______	Yes_______
Do you have unstable or severe angina?	No _______	Yes_______

<u>2. Congestive heart failure:</u>

Have you ever been treated for heart failure? *(You may have been short of breath and the doctor may have told you that you had fluid in your lungs or that your heart was not pumping well.)*	No _______	Yes_______

<u>3. Peripheral vascular disease:</u>

Have you had an operation to unclog or bypass the arteries in your legs?	No _______	Yes_______
Have you ever been diagnosed with intermittent claudication?	No _______	Yes_______

<u>4. Neurological Diseases:</u>

<u>Cerebrovascular accident:</u>

Have you had a stroke, cerebrovascular accident, blood clot or bleeding in the brain, or transient ischemic attack (TIA)?	No _______	Yes_______

<u>Hemiplegia:</u>

Do you have difficulty moving an arm or leg as a result of a stroke or cerebrovascular accident?	No _______	Yes_______

<u>Parkinson's Disease:</u>

Have you been diagnosed with Parkinson's Disease?	No _______	Yes_______

<u>Multiple Sclerosis:</u>

Have you been diagnosed with Multiple Sclerosis?	No _______	Yes_______

5. Chronic obstructive pulmonary disease:

Do you have asthma?	No _______	Yes_______
If YES, Do you take medicines for your asthma?	No _______	Yes_______
Do you take medicines only with flare-ups of asthma?	No _______	Yes_______
Do you take medicines regularly, even when not having a flare-up	No _______	Yes_______
Do you have emphysema, chronic bronchitis, or chronic obstructive lung disease?	No _______	Yes_______
If YES, Do you take medicines for your lung disease?	No _______	Yes_______
Do you take medicines only with flare-ups	No _______	Yes_______
Do you take medicines regularly, even when not having a flare-up	No _______	Yes_______

6. Ulcer disease:

Do you have stomach ulcers, or peptic ulcer disease?	No _______	Yes_______
If YES, has this condition been diagnosed by endoscopy (where a doctor looks into your stomach through a scope) or an upper GI or barium swallow study (where you swallow chalky dye and then x-rays are taken)?	No _______	Yes_______

7. Diabetes:

Do you have diabetes (high blood sugar)?	No _______	Yes_______
If Yes, is it treated by medications taken by mouth?	No _______	Yes_______
If Yes, is it treated by insulin injections?	No _______	Yes_______
Has the diabetes caused any of the following problems:		
Problems with your kidneys?	No _______	Yes_______
Problems with your eyes that were treated by an ophthalmologist?	No _______	Yes_______
Diabetic or peripheral neuropathy?	No _______	Yes_______

8. Renal (Kidneys):

Have you ever had any of the following problems with your kidneys?

Poor kidney function (blood tests show high creatinine)?	No _______	Yes_______
Have you used hemodialysis or peritoneal dialysis?	No _______	Yes_______
Have you received a kidney transplant?	No _______	Yes_______

9. Connective tissue disease:

Do you have rheumatic arthritis?	No _______	Yes_______
If Yes: Do you take regular medicine for rheumatic arthritis? *(this is not the same as Osteoarthritis)*	No _______	Yes_______

What areas are affected by rheumatic arthritis? ____

____

Do you have Lupus (systemic lupus erythematosus)?	No _______	Yes_______
Do you have Polymyalgia Rheumatica?	No _______	Yes_______

10. Dementia, liver disease, leukemia, lymphoma, tumor, metastases, AIDS:

Do you have any of the following conditions?

Alzheimer's Disease, or another form of dementia?	No _______	Yes_______
Cirrhosis, or serious liver damage?	No _______	Yes_______
AIDS?	No _______	Yes_______
Leukemia or polycythemia vera?	No _______	Yes_______
Lymphoma?	No _______	Yes_______
Cancer, other than skin cancer, leukemia, or lymphoma?	No _______	Yes_______
If Yes: Has the Cancer spread (metastasized) to other parts of your body?	No _______	Yes_______
If the Cancer has NOT spread, was it first treated less than 5 years ago?	No _______	Yes_______

11. Osteoarthritis:

Do you have osteoarthritis?	No _______	Yes_______
If Yes: Do you take medications for it regularly?	No _______	Yes_______

What areas are affected by osteoarthritis arthritis? ____

____

12. Thyroid:

Do you have a problem with your thyroid?	No _______	Yes_______
If yes, is it hypothyroid (low thyroid function)?	No _______	Yes_______

13. Hearing Problems:

Can you only hear shouted words, or do you have difficulty hearing in crowded places, or do you often depend on reading lips? Answer yes if ***any*** of these are true.	No _______	Yes_______

14. Vision Problems:

Can you only see outlines of objects and people, or do you need help in cooking, eating, dressing, bathing or going to the toilet ***because you have trouble seeing***? Answer yes if ***any*** of these are true.	No _______	Yes_______

15. Urinary Problems:

Do you frequently lose urine, to the extent that it keeps you from going out or engaging in activities at home that you would like to do?	No _______	Yes_______
Do you have an indwelling urinary catheter, urinary condom, or do you wear a heavy pad to catch urine? Do ***not*** count light pads, such as panty liners.	No _______	Yes_______

Thank you. That is the end of the section regarding your medical history. The next section focuses on your ability to complete certain activities during the day.

Directions: I would like you to indicate how much your fibromyalgia made it difficult to do each of the following activities during the past 7 days without the help of someone else or without the use of any assistive walking device like a cane, walker or wheelchair. Please rate the difficulty you have on a scale of 1 to 5. 1 means you cannot do the activity, 2 indicates that you have quite a lot of difficulty, 3 indicates some difficulty, 4 is a little difficulty and 5 is no difficulty. I will repeat the scale for you as needed or you could write it down. [repeat scale as needed].

Activity **How much difficulty do you have . . . *(remember this is without the help of someone else and without the use of any assistive walking device).***		**No Difficulty**	**A Little**	**Some**	**Quite a Lot**	**Cannot Do**
F1	Unscrewing the lid off of a previously unopened jar without using any devices	5	4	3	2	1
F2	Going up and down a flight of stairs <u>inside</u> without using a handrail	5	4	3	2	1
F3	Putting on and taking off long pants (including managing fasteners)	5	4	3	2	1
F4	Running ½ mile or more	5	4	3	2	1
F5	Using common utensils for preparing meals (e.g. can opener, potato peeler, or sharp knife)	5	4	3	2	1
F6	Holding a full glass of water in one hand	5	4	3	2	1
F7	Walking a mile, taking rests as necessary	5	4	3	2	1
F8	Going up and down a flight of stairs <u>outside</u> without using a handrail	5	4	3	2	1
F9	Running a short distance, such as to catch a bus	5	4	3	2	1
F10	Reaching overhead while standing, as if to pull a light cord	5	4	3	2	1
F11	Sitting down and standing up from a low, soft couch	5	4	3	2	1
F12	Putting on and taking off a jacket	5	4	3	2	1

Activity **How much difficulty do you have . . . *(remember this is without the help of someone else and without the use of any assistive walking device).***		No Difficulty	A Little	Some	Quite a Lot	Cannot Do
F13	Reaching behind your back as if to pull a belt through a belt loop	5	4	3	2	1
F14	Stepping up and down from a curb	5	4	3	2	1
F15	Opening a heavy, outside door	5	4	3	2	1
F16	Rip open a package of snack food (e.g. cellophane wrapping on crackers) using only your hands	5	4	3	2	1
F17	Pouring from a large pitcher	5	4	3	2	1
F18	Getting into/out of a car/taxi (sedan)	5	4	3	2	1
F19	Hiking a couple of miles on uneven surfaces, including hills	5	4	3	2	1
F20	Going up and down three flights of inside stairs using a handrail.	5	4	3	2	1
F21	Picking up a kitchen chair and moving it, in order to clean	5	4	3	2	1
F22	Using a step stool to reach into a high cabinet	5	4	3	2	1
F23	Making a bed, including spreading and tucking in bed sheets	5	4	3	2	1
F24	Carrying something in both arms while climbing a flight of stairs (e.g. laundry basket)	5	4	3	2	1
F25	Bending over from a standing position to pick up a piece of clothing from the floor	5	4	3	2	1
F26	Walking around one floor of your home, taking into consideration thresholds, doors, furniture, and a variety of floor coverings	5	4	3	2	1
F27	Getting up from the floor (as if you were laying on the ground)	5	4	3	2	1
F28	Washing dishes, pots, and utensils by hand while standing at the sink	5	4	3	2	1

Activity **How much difficulty do you have . . . *(remember this is without the help of someone else and without the use of any assistive walking device).***		No Difficulty	A Little	Some	Quite a Lot	Cannot Do
F29	Walking several blocks	5	4	3	2	1
F30	Taking a one mile, brisk walk without stopping to rest	5	4	3	2	1
F31	Stepping on and off a bus	5	4	3	2	1
F32	Walking on a slippery surface outdoors	5	4	3	2	1

Do you use a cane, walker or other walking devices?

If no, proceed to next section.

If yes,

Activity **When you use your cane, walker, or other walking device how much difficulty do you have…**		No Difficulty	A Little	Some	Quite a Lot	Cannot Do
FD7	Walking a mile, taking rests as necessary	5	4	3	2	1
FD8	Going up and down a flight of stairs outside, without using a handrail	5	4	3	2	1
FD14	Stepping up and down from a curb	5	4	3	2	1
FD15	Opening a heavy, outside door	5	4	3	2	1
FD26	Walking around one floor of your home, taking into consideration thresholds, doors, furniture, and a variety of floor coverings	5	4	3	2	1
FD29	Walking several blocks	5	4	3	2	1
FD30	Taking a one mile, brisk walk without stopping to rest	5	4	3	2	1
FD32	Walking on a slippery surface outdoors	5	4	3	2	1

This portion of the questionnaire focuses on activities that you may have done in the past 4 weeks. Each question has 2 parts. The first asks how many times a week you usually participate in a particular activity. The second asks how many hours in a typical week you actually did the activity. Here is an example:

Here is an example of how Mrs. Jones would answer these questions about the first activity—Visit with friends or family (other than those you live with): Mrs. Jones usually visits her friends Maria and Olga twice a week. She usually spends one hour on Monday with Maria and two hours on Wednesday with Olga. Therefore, the total hours a week that she visits with friends is 3 hours a week.

In a typical week during the past 4 weeks, did you…		**IF YES**, how many TIMES a week?	**IF YES**, how many TOTAL hours a week did you usually do it					
1. Visit with friends or family (other than those you live with)?	☐ **YES** ➔ ☐ **NO**	2	Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

It is also possible that you may not ever do some of these activities. Be sure to tell me that as well.

Here is the first question

In a typical week during the past 4 weeks, did you…		**IF YES**, how many TIMES a week?	**IF YES**, how many TOTAL hours a week did you usually do it					
1. Visit with friends or family (other than those you live with)?	☐ **YES** ➔ ☐ **NO**		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
2. Go to the senior center?	☐ **YES** ➔ ☐ **NO**		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
3. Do volunteer work?	☐ **YES** ➔ ☐ **NO**		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
4. Attend church or take part in church activities?	☐ **YES** ➔ ☐ **NO**		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
5. Attend other club or group meetings?	☐ **YES** ➔ ☐ **NO**		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

In a typical week during the past 4 weeks, did you…		IF YES, how many TIMES a week?	IF YES, how many TOTAL <u>hours a week</u> did you usually do it					
6. Use a computer?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
7. Dance (such as square, folk, line, ballroom) (do <u>not</u> count aerobic dance here)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
8. Do woodworking, needlework, drawing, or other arts or crafts?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
9. Play golf, carrying or pulling your equipment (count <u>walking time</u> only)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
10. Play golf, riding a cart (count <u>walking time</u> only)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
11. Attend a concert, movie, lecture, or sport event?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
12. Play cards, bingo, or board games with other people?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
13. Shoot pool or billiards?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
14. Play singles tennis (do <u>not</u> count doubles)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
15. Play doubles tennis (do <u>not</u> count singles)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
16. Skate (ice, roller, in-line)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
17. Play a musical instrument?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

In a typical week during the past 4 weeks, did you…		IF YES, how many TIMES a week?	IF YES, how many TOTAL hours a week did you usually do it					
18. Read?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
19. Do heavy work around the house (such as washing windows, cleaning gutters)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
20. Do light work around the house (such as sweeping or vacuuming)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
21. Do heavy gardening (such as spading, raking)?	☐ YES ➔ ☐ N O		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
22. Do light gardening (such as watering plants)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
23. Work on your car, truck, lawn mower, or other machinery?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
****Please note: For the following questions about running and walking, include use of a treadmill.**								
24. Jog or run?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
25. Walk uphill or hike uphill (count only uphill part)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
26. Walk fast or briskly for exercise (do not count walking leisurely or uphill)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
27. Walk to do errands (such as to/from a store or to take children to school (count walk time only)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
28. Walk leisurely for exercise or pleasure?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

In a typical week during the past 4 weeks, did you…		IF YES, how many TIMES a week?	IF YES, how many TOTAL hours a week did you usually do it					
29. Ride a bicycle or stationary cycle?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
30. Do other aerobic machines such as rowing, or step machines (do not count treadmill or stationary cycle)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
31. Do water exercises (do not count other swimming)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
32. Swim moderately or fast?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
33. Swim gently?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
34. Do stretching or flexibility exercises (do not count yoga or Tai-chi)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
35. Do yoga or Tai-chi?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
36. Do aerobics or aerobic dancing?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
37. Do moderate to heavy strength training (such as hand-held weights of more than 5 lbs., weight machines, or push-ups)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
38. Do light strength training (such as hand-held weights of 5 lbs. or less or elastic bands)?	☐ YES ➔ ☐ NO		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

In a typical week during the past 4 weeks, did you…		IF YES, how many TIMES a week?	IF YES, how many TOTAL hours a week did you usually do it					
39. Do general conditioning exercises, such as light calisthenics or chair exercises (do not count strength training)?	☐ **YES** ➔ ☐ **NO**		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
40. Play basketball, soccer, or racquetball (do not count time on sidelines)?	☐ **YES** ➔ ☐ **NO**		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours
41. Do other types of physical activity not previously mentioned (please specify) ________	☐ **YES** ➔ ☐ **NO**		Less than 1 hour	1-2½ hours	3-4½ hours	5-6½ hours	7-8½ hours	9 or more hours

Thank you. We are now finished with the section on physical activity. The next section focuses on your social support and attitudes about health.

Please indicate the best answer describing how you have felt over the past week by answering yes or no to the following questions:

1. Are you basically satisfied with your life? YES / NO

2. Do you often get bored? YES / NO

3. Do you often feel helpless? YES / NO

4. Do you prefer to stay at home, rather than going out and doing new things? YES / NO

5. Do you feel pretty worthless the way you are right now? YES / NO

Now I would like you to think about the people you rely on and how often this support is available to you when you need it. I'd like you to rate the support for each situation using a scale from 0 to 4 with 0 meaning none of the time, 1 is a little of the time, 2 is some of the time, 3 is most of the time and 4 is all of the time.

Type of support	None of the time	A little of the time	Some of the time	Most of the time	All of the time
1. Someone to help you if you were confined to bed.	0	1	2	3	4
2. Someone to take you to the doctor if you needed it.	0	1	2	3	4
3. Someone to prepare meals if you were unable to do it yourself.	0	1	2	3	4
4. Someone to help with daily chores if you were sick.	0	1	2	3	4

Please rate your agreement with the following statements using a scale of 1 to 7, where 1 is strongly disagree and 7 is strongly agree. If you are neutral, rate your agreement in the middle of the scale at 4.

How much do you agree with the statement…..	Strongly Disagree						Strongly Agree
When I make plans, I follow through with them.	1	2	3	4	5	6	7
I usually manage one way or another.	1	2	3	4	5	6	7
I am able to depend on myself more than anyone else.	1	2	3	4	5	6	7
Keeping interested in things is important to me.	1	2	3	4	5	6	7
I can be on my own if I have to.	1	2	3	4	5	6	7
I feel proud that I have accomplished things in life.	1	2	3	4	5	6	7
I usually take things in stride.	1	2	3	4	5	6	7
I am friends with myself.	1	2	3	4	5	6	7
I feel that I can handle many things at a time.	1	2	3	4	5	6	7
I am determined.	1	2	3	4	5	6	7
I seldom wonder what the point of it all is.	1	2	3	4	5	6	7
I take things one day at a time.	1	2	3	4	5	6	7
I can get through difficult times because I've experienced difficulty before.	1	2	3	4	5	6	7
I have self-discipline.	1	2	3	4	5	6	7
I keep interested in things.	1	2	3	4	5	6	7
I can usually find something to laugh about.	1	2	3	4	5	6	7

How much do you agree with the statement…..	Strongly Disagree						Strongly Agree
My belief in myself gets me through hard times.	1	2	3	4	5	6	7
In an emergency, I'm someone people can generally rely on.	1	2	3	4	5	6	7
I can usually look at a situation in a number of ways.	1	2	3	4	5	6	7
Sometimes I make myself do things whether I want to or not.	1	2	3	4	5	6	7
My life has meaning.	1	2	3	4	5	6	7
I do not dwell on things that I can't do anything about.	1	2	3	4	5	6	7
When I'm in a difficult situation, I can usually find my way out of it.	1	2	3	4	5	6	7
I have enough energy to do what I have to do.	1	2	3	4	5	6	7
It's okay if there are people who don't like me.	1	2	3	4	5	6	7
I am resilient.	1	2	3	4	5	6	7

Thank you. We are almost finished!

Lastly, we would like to know a little more about your background.

When were you born? Please provide only the month and year.______ \ ______
Month \ Year

What is your Gender? The choices are ___Male ___Female

What is your Race? The choices are
____American Indian or Alaska Native
____Asian
____Black or African American
____Native Hawaiian or Other Pacific Islander
____White

What is your ethnicity? The choices are
____Hispanic or Latino
____Not Hispanic or Latino

What is your current marital status? The choices are
____Never married ____ Separated ____ Married ____ Divorced
____ Living Together as Married ____Widowed

What is your Height and Weight? ____ft/____in (Height) _____lbs (Weight)

How much education have you received? The choices are

___Less than high school ___College but no degree ___Other

___ High school graduate/GED ___ Bachelor's degree

___ Associate/technical degree ___ Advanced degree

What is your current income level? The choices are

___Less than $20,000	___$40,000-49,000
___$20,000-29,000	___$50,000-75,000
___$30,000-39,000	___$75,000 +.

We are finished! Thank you so much for taking the time to complete this questionnaire. Do you have any questions or comments for me before we end the interview?

Questions/Comments: