

SOCIAL SUPPORT AS A MODERATOR BETWEEN
STRESS AND CHRONIC PAIN IN OLDER
ADULTS WITH FIBROMYALGIA

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ABSTRACT

The etiology of fibromyalgia is unknown; thus, research on the psychosocial factors contributing to the symptomatology of fibromyalgia is an important area of study. Research indicates that perceived stress and perceived social support affect the experience of chronic pain, but the relationship between the two has been under-studied. The purpose of this study is to explore the association between perceived stress, perceived social support and chronic pain among older adults with and without fibromyalgia. Social support was tested as a moderator of the relationship between stress and pain. Results revealed that social support did not significantly moderate the relationship between stress and pain in either the fibromyalgia or control group. However, stress was found to be strongly associated with pain among people with fibromyalgia. In contrast, among those without fibromyalgia, social support was related to chronic pain but stress was not. These findings demonstrate that perceived stress and perceived social support may play an important role in the expression of chronic pain among older adults. Future research should further investigate the impact psychosocial factors have on chronic pain disorders, more specifically fibromyalgia.

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CHAPTER 1

INTRODUCTION

Chronic pain is a public health issue in the United States. Roughly 7% to 13% of the population experiences chronic widespread pain, which demonstrates its significant impact on society and individuals (Ericsson, Nystrom, & Mannerkorpi, 2015; Mundal, Grawe, Bjorngaard, Linaker, & Fors, 2014). Among community-dwelling older adults, it has been found that up to 40% suffer from chronic pain and that chronic pain worsens with age. When chronic pain is experienced among older adults, it interferes with daily behaviors leading to a decrease in quality of life. Increased stress and isolation are also common among individuals suffering from chronic pain (Boggero, Geiger, Segerstrom, & Carlson 2015; Pelegrin, Siqueira, Garbi, Saltareli, & Sousa, 2014).

Fibromyalgia (FM) syndrome is a particular type of chronic widespread pain characterized by musculoskeletal pain, fatigue, and cognitive dysfunction. FM is estimated to affect 1% to 3% of the population, roughly five million adults. Age and gender have been shown to be associated with FM; as individuals age they are more likely to experience FM, and women are more often affected (Ericsson et al., 2015; Farin, Ulrich, & Hauer, 2013; Wier, Harlan, Nkoy, & Jones, 2006; Wierwille, 2012; Zettel-Watson, Rakovski, Levine, Rutledge, & Jones, 2011). Using the 1990 diagnostic criteria, FM was diagnosed when patients experience allodynia, a decreased pain threshold in 11 out of 18 painful ‘tender points’ (Crettaz et al., 2013; Smith et al., 2009, Weirwille;

Woda, L'heveder, Ouchchane, & Bodere, 2013; Wolfe et al., 1990). Since the underlying causes of FM are unknown, the treatment and understanding of FM can be a hardship among those with a diagnosis. As the cost of health care rises, individuals who suffer from chronic pain are greatly impacted. The annual health care costs for FM are estimated to be over \$20 billion dollars each year, which highlights the need to further investigate the everyday functioning and psychosocial factors affecting those with FM and other chronic pain conditions (Oliver, Cronan, Walden, & Tomita, 2001; Zettel-Watson et al., 2011).

Comorbidities

It is important to understand that although FM is classified as its own chronic pain syndrome, the related outcomes and factors have been found to be similar among many chronic pain disorders. The outcomes for individuals with FM are similar to other chronic pain conditions such as arthritis, rheumatoid arthritis and lower back pain. Those same chronic pain conditions are also common comorbid conditions of FM (Amir et al., 2000; Harris, Loxton, Sibbritt, & Byles, 2013). A study by Wier and colleagues (2006) examined the incidence rates of conditions comorbid with FM. The authors looked at depression, anxiety, irritable bowel syndrome, headaches, chronic fatigue, lupus, and rheumatoid arthritis as seven possible comorbidities. A total of 2,595 participants diagnosed with FM were gathered from the Deseret Mutual Benefit Administration Database. The comorbidities were assessed through the International Classification of Diseases, 9th Revision, Clinical Modification. It was found that FM patients were anywhere from 2% to 7% more likely to be diagnosed with one of the seven comorbidities examined when compared to patients without an FM diagnosis.

Psychosocial Factors and Chronic Pain

Common psychosocial factors affecting chronic pain consist of anxiety, stress, depression, and social support. However, research on the relationship and direction between psychosocial factors and chronic pain has provided mixed findings (Ferreira-Valente et al., 2014; Harris et al., 2013; Woda et al., 2013). Both chronic pain conditions and FM are related to psychosocial factors including anxiety and depression, as well symptoms associated with stress such as chronic fatigue and reduced cognitive functioning (Ericsson et al., 2015). As pain increases, there tends to be an increase in stress levels, anxiety, and depression (Ferreira-Valente et al., 2014). These psychosocial variables are important indicators of how individuals will function with pain (Ferreira-Valente, 2014; Weir et al., 2006; Woda et al., 2013). Both physical and social functioning tend to become more difficult among those with chronic pain and one's ability to function is affected by an increased experience of stress, anxiety, and depression. There also tends to be lower reported social support when pain levels are higher (Farin et al., 2013). Social limitations commonly occur when the symptoms of FM increase, which can lead to a reduction in social support (Farin et al., 2013; Ferreira & Sherman, 2007).

Factors Influencing Fibromyalgia

In a past review on the current knowledge of FM, it was noted that cognitive, psychosocial, and behavioral factors can influence FM symptoms (Crettaz et al, 2013; Lopez-Martinez, Esteve-Zarazaga, & Ramirez-Maestre, 2008; Montoya, Farbig, Braun, Preissl, & Birbaumer, 2004; Wierwille, 2012; Wolf & Davis, 2014). For instance, those diagnosed with chronic pain disorders are more likely to experience psychological distress, physical disabilities, and poorer social relationships (Amir et al., 2000; Ferreira

& Sherman, 2007; Ferreira-Valente, 2014; Harris et al., 2013; Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003). Also, in a study by Lopez-Martinez et al. (2008), it was found that pain severity was influenced by factors such as social support, coping, and mood. These findings indicate the existing relationship between pain symptomatology and the psychological and social aspects of chronic pain disorders.

Another illustration of the relationship psychosocial, cognitive, and behavioral factors have with chronic pain derives from outcomes related to pain interference. Pain interference is when pain hinders daily living, including impairments in cognitive functioning, social interactions, recreation, emotionality, and physical functioning. Jensen, Moore, Bockow, Ehde, and Engel (2011) reviewed literature on chronic pain conditions and found associations between pain interference, social support, and psychological functioning. Examining health outcomes in relation to these factors among individuals with FM and chronic pain conditions could provide a better understanding of the disease process.

While there are many similarities in the outcomes and variables associated with both FM and chronic pain patients, it has been found that pain, distress, and disability are more common among individuals with FM (Montoya et al., 2004; Smith et al., 2009). These findings showcase the need for more psychosocial research specific to FM populations. The current study examined the influence perceived social support may have on the relationship between perceived stress and chronic pain, within an older adult population of FM patients. More specifically, perceived social support was studied as a possible moderator between perceived stress and chronic pain outcomes.

Perceptions of Psychosocial Factors

Research has shown that perceptions of psychosocial factors might be more useful in predicting chronic pain and health outcomes than objective measures (Haber, Cohen, Lucas, & Baltes, 2007; Harris et al., 2013; Kawachi, & Berkman, 2001). Ericsson and colleagues (2015) explains that objective measures, such as stress biomarkers, have not provided enough information to be useful in clinical treatments. Thus, perceptions of psychological distress are currently the best assessment tools of pain-related symptomatology because they are useful in identifying the clinical manifestation of symptoms such as fatigue, disturbed sleep, and reduced concentration or memory (Ericsson et al.). Since the etiology of FM is unknown, subjective measures of psychosocial factors are helpful in identifying risk factors and symptomatology (e.g. muscle pain and exhaustion, and cognitive deficits). This suggests that examining perceptions, such as perceived stress and perceived social support, might be the best way to measure and capture the expression of psychosocial influences among chronic pain patients.

Perceived Stress and Chronic Pain

FM has been found to be a stress-related syndrome and individuals with FM tend to report higher levels of stress (Ericsson et al., 2015). Studies investigating FM are now finding that stress plays an important role in the experience or expression of FM symptoms (Smith et al., 2009; Woda et al., 2013). Stress and pain have a well-established relationship and have been researched across many different populations (Crettaz et al., 2013; Ericsson et al., 2015; Gianaros & Wagner, 2015; Harris et al., 2013; Martin, Phil, & Soon, 1993; White et al., 2014). Psychological stress, otherwise known as perceived

stress, is a public health risk because of the influence it has on chronic diseases (Gianaros & Wagner, 2015). Higher perceived stress is frequently linked to declines in mental and physical health (Smith et al.). When comparing studies using objective or biological measures of stress and studies using perceived stress measures, perceived stress tends to reveal more about health outcomes (Crettaz et al.; Ericsson et al.; Gianaros & Wagner; Harris et al.; Woda et al., 2013) Perceived stress has been found to be a better measure of the actual stress one experiences because it evaluates an individual's appraisal of stressful situations, whereas an objective measure only looks at how many stressful situations have occurred (White et al.).

A study by Smith and colleagues (2009) aimed to examine the association stress has with FM by comparing women with FM to a group of healthy controls, women without FM. The researchers examined the relationship between FM and increased stress exposure, and tested the association perceived stress may have on women diagnosed with FM. They also assessed the amount of traumatic events women with FM tended to experience. A total of 85 female participants were recruited, 41 were diagnosed with FM and 44 were healthy controls. The participants' ages ranged from 30 to 60 years. The relationship between traumatic events, perceived stress, and mental and physical health outcomes were studied. It was found that women with FM had higher perceived stress and more reported traumatic events than the healthy controls. Pain, distress, and disability were found to be more common among FM patients in comparison to healthy controls. Also, in both the FM and healthy control groups, perceived stress was correlated with poorer mental and physical health, including bodily pain. This study provided evidence for the relationship stress has with mental and physical health among women with and

without FM. As evidenced by the findings, FM could be described as a ‘stress-related’ syndrome because it was found that FM patients are more likely to report higher levels of perceived stress than healthy individuals. In addition, stress was related to lower emotional and physical wellbeing.

To further illuminate the relationship between stress and chronic pain conditions, Ericsson et al. (2015) looked at the psychometric properties of the Stress and Crisis Inventory (SCI-93) within a population of 166 women with FM or chronic widespread pain (CWP). The SCI-93 measures the severity of stress symptoms associated with the autonomous nervous system, such as muscle pain, stiffness and exhaustion. The measure can help reveal how stress maintains the experience of widespread pain. Ericsson and colleagues discussed that individuals with FM have restricted physical capacity, which can lead to increased stress and being constantly stressed can negatively impact one’s health and ability to recover. The participants in each group (FM and CWP) were age-matched and had a mean age of 46 years. The researchers conducted this study to expand the current understandings of how stress reactions and symptoms could be associated with allodynic responses among chronic pain patients. The FM and CWP groups were both found to have increased levels of stress as measured by stress symptoms (i.e. muscle pain, muscle stiffness, irritability, disturbed sleep, etc.) in comparison to age-matched healthy controls. These findings provide support for the differences in stress among patients with FM compared to healthy controls.

White et al. (2014) conducted a study to assess the relationship between perceived stress and measures of pain intensity and pain interference among older adults. The study used a cohort of community dwelling older adults, aged 70 years of age and older.

Participants were recruited from the Einstein Aging Study. It was hypothesized that higher scores on the Perceived Stress Scale (PSS) would indicate higher scores on measures of pain severity and pain related disability (i.e., pain interference). The results revealed a significant positive association between PSS scores and pain intensity and interference among older adults. Using an older population to test this relationship is helpful for future research in chronic pain conditions because chronic pain is more common among older adults; though, previous studies have primarily focused on samples of middle-aged adults or children (Alfven, 2013; Ericsson et al., 2015; Smith et al., 2009). This helps add to the current literature on the relationship between perceived stress and pain, particularly among older adults. However, the study used a population of healthy older adults, which shows the need for more research on the associations between perceived stress and pain in FM specific populations.

Another study by Harris et al. (2013) went beyond just looking at the relationship between stress and chronic pain, and assessed the effect perceived stress has on the development of arthritis. The study included a sample of over 10,000 women from an Australian longitudinal study on women's health from 1946 through 1951. The researchers evaluated physical, psychological, and social factors. Results revealed that perceived stress was linked to the development of arthritis, such that moderate to high amounts of perceived stress were related to the onset. Furthermore, those with moderate and high amounts of perceived stress were 2.4 to 7 times more likely to develop arthritis. These results demonstrate support for viewing perceived stress as a risk factor among those with chronic pain, and it may be just as influential as body weight and nutritional factors (Harris et al., 2013).

Social Support

Another important psychosocial variable that has been shown to affect chronic pain is social support (Farin et al., 2013; Heinrichs et al., 2003; Montoya et al., 2004; Osborne, Jensen, Edhe, Hanley, & Kraft, 2007). Symptoms experienced by FM patients tend to interfere with everyday life and functioning, which leads to poorer social interactions and lower satisfaction in social relationships. Difficulties in maintaining social support and having social interactions could be more detrimental than the physical limitations from chronic pain in FM (Farin et al., 2013). The relationship between physical health outcomes and social support has been extensively researched and results provide evidence that social support can directly influence one's health (Uchino, 2009; Haber et al., 2007). Social support can be divided into two types: received or actual social support and perceived social support. Perceived social support refers to one's perception of access to receiving social support. Received social support deals with the tangible amount of social support resources one reports (Uchino). Both types of social support have been shown to have an influence on health outcomes (Amir, 2000; Montoya et al.; Uchino). However, the two types of social support have also been shown to have different relationships with chronic pain outcomes (Farin et al.; Haber et al.; Montoya et al.). Thus, it is important to distinguish between the two types of social support and chronic pain.

Social support is a "meta-construct" consisting of several sub-constructs. Perceived support and received support have been linked to health outcomes, but received support is the primary constituent factor in perceived support (Haber et al., 2007). Uchino (2009) used a lifespan perspective in reviewing current literature on

perceived versus received social support. The aim of the study was to look at the different relationships between physical health outcomes and social support. Differences in the types of social support (i.e. received and perceived) and physical health, including the course of chronic diseases, were examined. Overall, social support measures were regularly linked to physical health outcomes. When looking at the types of social support separately, it was found that perceived support was a more important indicator of health outcomes than received support.

It is crucial to separate these concepts because they result in different outcomes (Uchino, 2009). Research on received social support and chronic pain has provided mixed results. Montoya et al. (2004) examined the influence received social support and affective mood had on pain perceptions. The presence of a significant other was used to represent social support. There were 18 patients with FM and 18 patients with migraines used as a control group. The two groups ranged in age from 34 to 68 years old. The experiment used thermal pain thresholds to evaluate pain sensitivity. When comparing social support, it was found that FM patients who had a significant other present during the experiment showed significantly lower levels of perceived pain compared to migraine patients who had a significant other present. Overall, FM patients also demonstrated greater sensitivity and lower pain thresholds than migraine patients.

The way received social support is operationally defined in studies varies greatly, making it difficult to interpret the influence of received social support on health. Jensen and colleagues (2011) reviewed 29 current studies looking at the chronic pain of patients with disabilities including spinal cord injury (SCI), cerebral palsy (CP), multiple sclerosis (MS), muscular dystrophy (MD), and acquired amputation. The researchers assessed

social factors, specifically received social support, among individuals with chronic pain and physical disabilities. The authors found that when patients with chronic pain reported higher levels of concerned responses from spouses or close individuals, it was related to increases in measures of pain intensity. Thus, when significant others or spouses gave solicitous responses, the patients' pain functioning tended to worsen.

Building on the mixed operationalization of received social support amongst studies, Oliver et al. (2001) conducted a study using interventions among patients with FM to promote better health and wellness. Interventions using education and social support were carried out, and psychosocial factors and health status were evaluated. The study recruited 600 FM patients from a health maintenance database. There were a total of 572 women and 28 men, with a mean age of 52 years. Support group meetings were used as the received social support. The findings showed no improvement in health care utilization among FM patients with or without the intervention. There was also no improvement in the physical or mental impact of FM, self-efficacy, and no increase in knowledge of FM. The findings from this study underscore the need to measure social support in a way that will best capture how it interacts with FM and health functioning. It also could show that received social support might be more meaningful when looking at support coming from significant others instead of general received social support. Nonetheless, using received social support to assess the effects of physical and mental functioning among FM patients has not provided consistent results among past studies (Jensen et al., 2011; Montoya et al., 2004; Oliver et al.).

Received social support tends to be related to situational contexts, meaning that the circumstance for receiving support will be different depending on the situation

(Uchino, 2009). For example, when a chronic pain patient is in a hospital setting versus at home the influence of received social support can differ. Received social support needs to meet the requirements of a given situation, whereas perceived social support is related to more global outcomes, such as health and wellbeing (Uchino). Perceived availability of social support is also related to physical well-being, regardless of the amount of social support received (Kahn, Hessling, & Russell, 2003). In the study by Jensen et al. (2011), the researchers examined a measure of perceived social support among disabled patients (acquired amputation, SCI, CP, MS, MD) with chronic pain. The results revealed that higher perceived social support was significantly related to less pain and better functioning. These results show that perceived social support could be a better measure of health functioning among chronic pain patients.

Social support is not only a physical resource but also a psychological resource (Cohen, Janicki-Deverts, Turner, & Doyle, 2015). Lopez-Martinez et al. (2008) conducted a study to assess the relationships among perceived affectionate and confidant social support, coping responses to pain, and pain intensity. It was hypothesized that perceived social support and pain coping would both independently influence reported levels of pain. The study used a sample of 117 patients with chronic pain who were recruited from the clinical pain unit of a university hospital in Spain, and the participants had a mean age of 54 years. The findings revealed that higher perceived social support was related to more active coping and lower reported pain intensity. This article highlights the importance of perceived social support and the benefit it can have for those suffering from chronic pain. It also emphasizes the importance of looking at the influence psychosocial variables can have on chronic pain outcomes.

Perceived Social Support and Chronic Pain

The relationship between received social support and chronic pain may be unclear, but studies using measures of perceived social support demonstrate support for the impact and significance of examining perceived social support in relation to chronic pain outcomes (Cohen, 2015; Jensen et al., 2011). Perceived social support is found to better explain satisfaction of social relationships and psychological health of older adults (Stephens, Alpass, Towers, & Stevenson, 2011). In regards to perceived social support, knowing that a social support network exists could be a stronger factor in wellbeing than received social support because social support networks can vary greatly among individuals. Studies have found that the size of one's social network is not associated with physical or psychological health (Jensen et al; Stephens et al.). One individual may have high perceived social support but their actual received social support only comes from a few individuals. Lower perceived social support and higher perceived isolation have both been associated with poorer chronic disease outcomes, which can lead to a loss in quality of life (Farin et al., 2013; Jensen et al., 2011; Stephens et al., 2011).

A variable found to be related to perceived social support is loneliness (Shaw & Grant, 2002; Stephens et al., 2011). When there is a lack of desired intimacy and relationships loneliness arises. Loneliness has been found to be associated with higher perceived stress, poorer social interactions and appraisals, and increased pain (Wolf & Davis, 2014). Loneliness is related to poorer outcomes for chronic pain patients, and higher perceived social support could help alleviate this, leading to better overall health outcomes. Decreases in physical health such as inflammation from stress, sleep

disturbances, low immune functioning, and cardiovascular risk are all associated with chronic loneliness (Wolf & Davis).

A study supporting the belief that higher perceived social support could help improve feelings of loneliness, and thus improve health outcomes of chronic pain patients was conducted by Stephens and colleagues (2011). The researchers aimed to examine the effect social networks have on health in older adults aged 55 to 70 years old. Measures of perceived social support and loneliness were used. Perceived social support was measured through questions on attachment, social integration, reassurance of worth, reliable alliance, guidance, and opportunity for nurturance subscales. Social isolation (i.e., loneliness) was measured with a single item asking “In the last 12 months how often have you felt lonely or isolated?” Results revealed that poorer health outcomes in older adults were related to lower perceived social support. These findings demonstrate the significance of analyzing the effects of social support in physical health outcomes of older adults.

A study by Ferreira-Valente (2014) evaluated how coping responses, self-efficacy beliefs and social support help individuals with chronic pain syndromes adjust to the disorder. The existing models of chronic pain acknowledge the influence of psychosocial factors on the effects of chronic pain in daily life. The study measured pain intensity, pain interference, self-efficacy beliefs, perceived social support, physical and psychological functioning, and pain coping among 324 Portuguese patients diagnosed with musculoskeletal pain. Ferreira-Valente hypothesized that perceived social support and self-efficacy beliefs would negatively impact pain intensity and pain interference. It was also hypothesized that better general physical and psychological functioning would be

associated with higher levels of self-efficacy and perceived social support. It was found that lower perceived social support and poor coping responses were linked to greater amounts of pain as well as worse physical and psychological functioning. Greater self-efficacy beliefs were found to be positively associated with all of the psychological and physical functioning variables. These significant findings demonstrate the importance of looking at the influence perceived social support has on chronic pain and psychological functioning.

Perceived Stress and Perceived Social Support

Perceived social support has been found to help protect against psychological distress from stressful events. Current frameworks for perceived social support predict that environmental factors influence perceived stress and physical health outcomes (Uchino, 2009). A model that helps to define the relationship between perceived stress and social support is the stress buffering model. The model hypothesizes that the perceived availability of social support is able to safeguard against negative effects of stress. This in turn allows for individuals to better cope (Cohen et al., 2015). Individuals with chronic pain conditions who cope better are shown to have better outcomes (Jensen et al., 2011). Kawachi and Berkman (2001) conducted a study to evaluate the current literature on social ties and mental health outcomes. The study examined psychosocial factors and mental health outcomes and found that perceived social support helped individuals cope with threats. Also, those with higher social support tended to appraise stressful situations as less threatening, leading to better behavioral and emotional outcomes. These findings could apply to a model with perceived social support, perceived stress, and chronic pain.

Wolf and Davis (2014) conducted a study to investigate loneliness and interpersonal stress within older adults experiencing chronic pain. It was found that older adults with chronic pain reported increased levels of loneliness. The researchers also found that loneliness, both chronic and transient, was related to increased pain symptoms and interpersonal experiences were interpreted as more stressful. Thus, socially-isolated individuals tended to experience greater amounts of stress and reported fewer positive interpersonal experiences. If loneliness is related to increased levels of stress, then having social support may be important in those with chronic widespread pain and FM. Perceived social support could alleviate feelings of stress and reduce pain. Even just brief periods of loneliness were found to be associated with increased pain and interpersonal stress. However, these results were lessened when individuals experienced positive interpersonal events. This provides a basis for hypothesizing that social support could mitigate symptoms of pain and stress.

Perceived Stress, Perceived Social Support, and Chronic Pain

It has been established that social support and perceived stress are associated with both psychological and physical well-being (Ferreira-Valente, 2014; Gianaros & Wagner, 2015; Harris et al., 2013; Smith et al., 2009). The relationship between perceived stress and social support has also been researched, but to date there have been no studies examining the direct influence perceived social support has on the relationship between perceived stress and FM. Amir et al. (2000) examined the association of psychosocial factors in an FM group, other patient groups including rheumatoid arthritis and lower-back pain, and healthy controls. The variables analyzed were coping styles and social support. The FM, chronic pain, and healthy control groups were not significantly

different on the variables studied. The findings of this study contradict findings on differences between FM and control groups regarding psychosocial factors, suggesting that perceived social support may not have a direct and clear relationship with chronic pain.

Osborne et al. (2007) aimed to identify whether the same psychosocial factors that are associated with other chronic pain disorders are similar among patients with multiple sclerosis (MS). MS is a disorder also characterized by chronic pain symptoms. The factors researched were catastrophizing beliefs and attributions towards pain and pain coping strategies, as well as social and environmental factors. It was hypothesized that perceived social support, pain catastrophizing, and coping strategies would be significantly associated with pain related outcomes. Measures for pain intensity, pain interference and coping, psychological functioning, pain cognitions, and perceived social support were used. The results revealed that the relationship between perceived social support and pain outcomes in MS patients was unclear. The results indicated that perceived social support was not directly related to pain intensity or pain interference. This again provides evidence for why perceived social support should be examined as a possible moderator in those with chronic pain. If perceived social support does not directly affect pain related outcomes, then it may have more of an influence on the relationship between other psychological factors, such as stress and chronic pain.

There have been no studies investigating perceived social support as a moderator between FM and perceived stress. An older study by Martin et al. (1993) looked at the relationship between social support, both received and perceived, perceived stress, and chronic headaches, but did not test for possible moderation effects of perceived social

support. The participants in the study included 62 people in a chronic headaches group, with a mean age of 38 years. The control group consisted of 64 people with a mean age of 33 years. It was found that individuals who experienced chronic headaches and migraines showed a lack of perceived social support when compared to healthy controls. When received social support was examined between the groups, no differences were observed. Only the perceptions of social support and satisfaction with available support were significant. Also, perceived stress was found to be higher among chronic headache sufferers.

There is a lack of research regarding perceived social support and perceived stress in chronic pain outcomes among older adults. The findings from the past study by Martin and colleagues (1993) can only be loosely applied to the proposed model of chronic pain and associated factors. The study evaluated migraines and tension-type headaches, which are found to be comorbidities of FM and have similar symptomologies, highlighting the importance of the results (Wier et al., 2006). The results from Martin et al. also begin to emphasize the need for more exploration between these variables among chronic pain patients, yet at the moment, there is still a gap in the research.

Research has demonstrated the relationship perceived stress and perceived social support have with each other in chronic pain patients but not in FM patients. In addition to investigating the influence perceived stress has on arthritis in a longitudinal sample of Australian women, Harris and colleagues (2013) also examined perceived social support as a moderator between perceived stress and arthritis. The researchers hypothesized that perceived social support could moderate the relationship between the onset of arthritis and the effects of perceived stress. The results of the study indicated that social support

was ineffective in mitigating the negative effects of perceived stress and that having arthritis was a non-significant predictor of higher perceived stress. This suggests that it may be more valuable to treat the onset of arthritis, or other chronic diseases, as an outcome and perceived stress as a predictor variable when investigating the influence of perceived social support. Nonetheless, these results do demonstrate the importance of investigating psychosocial factors, especially perceived stress and perceived social support. The study also pointed out that other chronic pain research on rheumatoid arthritis found similar results, suggesting that perceived stress has a significant effect on pain symptoms and might be related to the onset of chronic disease.

Past studies have put effort into studying psychosocial factors with many chronic pain syndromes (Jensen et. al., 2011; Lopez-Martinez et al., 2008; Osborne et al., 2007). However, there is currently a gap in FM research because no studies have analyzed the impact perceived social support has on the relationship between perceived stress and chronic pain. The aim of the current study was to add to the current literature on the relationship psychosocial variables have with chronic pain among older adults diagnosed with FM and healthy controls. Perceived social support, perceived stress, and chronic pain assessments were measured using questionnaires. Social support was operationalized through the Medical Outcomes Survey-Social Support (MOS-SS), which assessed the availability of emotional, tangible, affectionate, and positive social interactions (Sherbourne & Stewart, 1991). Perceived stress was measured using the Perceived Stress Scale (PSS), a questionnaire that tapped into the way individuals experience stressors in daily life (Cohen, Kamarck, & Mermelstein, 1983). The National Fibromyalgia

Association Questionnaire (NFAQ) was used to quantify chronic pain symptoms because it measured FM participants' symptoms and physical functioning (Jones, Rutledge, Jones, Matallana, & Rooks, 2008).

Hypotheses

Hypothesis 1

Higher perceived stress will be associated with increased chronic pain in both older adults with FM and the healthy control group.

Hypothesis 2

In the FM group, perceived social support is predicted to moderate the relationship between perceived stress and chronic pain. Such that, when perceived social support is low, perceived stress will have a stronger relationship with chronic pain. When perceived social support is high, the relationship between perceived stress and chronic pain is not expected to be significant.

Hypothesis 3

In the healthy control group, perceived social support is not expected to moderate the relationship between perceived stress and chronic pain.

CHAPTER 2

METHODS

Participants

Participants in the present study came from data collected in 2014 for a longitudinal study on the physical and cognitive status of people aged 50 and over with and without FM (Cherry, Zettel-Watson, Shimizu, et al., 2012; Cherry, Zettel-Watson, Chang, et al., 2012; Jones, Rutledge, & Aquino, 2010). The longitudinal study began in 2008, and data were collected every two years, ending in 2014. Participants were recruited through advertisements at local FM support groups, senior centers, and senior housing facilities. Recruitment also occurred through telephone calls made and emails sent to participants from the California State University, Fullerton (CSUF) Fibromyalgia Research and Education Center, now known as the Fibromyalgia and Chronic Pain Center, and the Gerontology Center. To participate, individuals with or without FM needed to be 50 years or older, community dwelling, and functionally independent (i.e., not wheel-chair bound).

The exclusion criteria for the study were inability to walk for six minutes without assistance, experiencing chest pain, dizziness, or pain during exercises, a history of cardiovascular disease including heart disease or high blood pressure, or if participants were advised by their doctor not to exercise. Participants with FM were required to provide documentation from a licensed physician, meeting the 1990 American College of

Rheumatology criteria (Wolfe et al., 1990). The current study accounted for demographic variables including age, sex, ethnicity, education level, and comorbidities. The participant characteristics are shown in Table 1. The sample size from year 2014 of the longitudinal study was a total of 49 FM and 45 non-FM participants. The longitudinal study, as well as future analyses of the data, was approved by the CSUF Institutional Review Board.

Table 1

Demographic Characteristics

Participants	FM (49)					Non-FM (45)				
	<i>M</i>	<i>SD</i>	Range	N	%	<i>M</i>	<i>SD</i>	Range	N	%
Age	63.29	7.05	50 - 77	-	-	72.56	9.01	50 - 93	-	-
Sex										
Female	-	-	-	45	91.8	-	-	-	29	64.4
Male	-	-	-	4	8.2	-	-	-	16	35.6
Ethnicity										
Caucasian	-	-	-	41	83.7	-	-	-	38	84.4
Asian	-	-	-	1	2.0	-	-	-	4	8.9
American Indian	-	-	-	1	2.0	-	-	-	1	2.2
Multi-racial*	-	-	-	4	8.2	-	-	-	2	4.4
Education										
Grade school	-	-	-	1	2.0	-	-	-	1	2.2
High school/ GED	-	-	-	3	6.1	-	-	-	1	2.2
Technical/ CC/ some college	-	-	-	16	32.7	-	-	-	5	11.1
College degree	-	-	-	17	34.7	-	-	-	22	48.9
Graduate degree	-	-	-	12	24.5	-	-	-	16	35.6
# of Comorbidities**										
0	-	-	-	16	32.7	-	-	-	21	46.7
1	-	-	-	18	36.7	-	-	-	19	42.2
2	-	-	-	14	28.6	-	-	-	4	8.9
3	-	-	-	1	2.0	-	-	-	1	2.2

Note. *Includes Hispanic. **Includes rheumatoid arthritis, non-rheumatoid arthritis, osteoporosis, and migraines.

Measures

Demographics

The longitudinal study used a questionnaire designed to gather demographic information consisting of age, sex, ethnicity, education, and medical history. The medical history accounted for comorbidities including rheumatoid arthritis, non-rheumatoid arthritis, osteoporosis, and migraines. There was also a question on the demographics questionnaire that assessed for pain interference. The question asked participants about the degree to which bodily pain that interfered with activities of daily living (ADL) in the past four weeks. There were five possible Likert responses, including none (1), slightly (2), moderately (3), quite a bit (4), and severely (5).

Perceived Stress Scale

The Perceived Stress Scale (PSS) is used to measure the perceived levels of stress participants experience in their daily life (Cohen et al., 1983). The PSS consisted of 14 items and the items assessed the degree to which participants perceive their life as being unpredictable, uncontrollable, and overloading. An example of an item includes: “How often have you felt confident about your ability to handle your personal problems?” Participants rated the items on a five-point Likert scale from 0 = never to 4 = very often. PSS scores were obtained by reversing the scores on positive questions 4, 5, 6, 7, 9, and 10. Total calculated scores range from 0 to 70, and higher scores indicated greater overall distress. The PSS has demonstrated strong test-retest reliability, $r = .85$ for a two-day test-retest reliability and $r = .55$ for a six-week test-retest time interval. Cronbach’s alpha for the PSS in the present study was .92.

Medical Outcomes Study –Social Support

The Medical Outcomes Study – Social Support Survey (MOS-SS) consists of 19 items focused primarily on functional aspects of support (Sherbourne & Stewart, 1991). Since received support is confounded with need and may not accurately reflect the amount of support that is available to a person, the MOS-SS taps into the perceived availability of functional support. Four components of perceived availability of social support were measured. Emotional support evaluated the expression of positive affect, empathetic understanding, and the encouragement of expressions of feelings. Informational support looked at the offering of advice, information, guidance or feedback, and tangible support assessed material aid or behavioral assistance. Both emotional and informational support items were indicative of supportive communication. Affectionate support measured loving and nurturing relationships, and involves expressions of love and affection. Positive social interaction questions determined whether participants have friends available to have fun with them. An additional item asks participants the extent to which they “have someone to do things with to help you get your mind off things”.

The Likert response scale ranged from 1 to 5, with 1 representing “None of the time” and 5 representing “All of the time”. To calculate scores on the MOS-SS, positive scores on questions 4, 5, 7, and 8 were reversed. Higher subscale and overall scale scores represented having more social support. The subscales can be used as separate measures of social support. Results from Sherbourne and Stewart (1991) demonstrated high convergent and discriminate validity of items, supporting the dimensionality of the measure. Cronbach’s alpha coefficient for the total scale in the current study was .98.

Test-retest reliability was assessed at one year and for the subscales, the coefficients ranged from $r = .72$ to $.76$. The overall scale score had a test-retest reliability of $r = .78$ (Sherbourne & Stewart).

National Fibromyalgia Association Questionnaire – Pain

The National Fibromyalgia Association Questionnaire (NFAQ) is a 121-item questionnaire covering five main areas including background information (questions 1 – 25), symptoms of FM (questions 26 – 51), physical functioning and physical ability impact (questions 52 – 63), employment impact (questions 64 – 87), and nature and effectiveness of interventions (questions 88 – 121; Bennett et al., 2007; Jones et al., 2008). The current study used the pain symptom responses from the NFAQ. The symptoms subcategory assessed 19 chronic pain symptoms experienced in the last week. A Likert rating scale was used, ranging from 0 to 10, with 10 being the most severe. Hence, higher scores represented more pain. Content validity and test-retest reliability have been found to be acceptable. The test-retest reliability for individual items through intra-class correlated coefficients ranged from $.53$ to $.94$, and Cronbach's alpha was found to be $.88$ (Cherry et al., 2012; Jones et al., 2008; Trinh, 2005).

Procedure

After screening for eligibility and inclusion criteria, eligible participants were scheduled for the study. A study consent form and questionnaire were mailed to the participants to complete before their scheduled appointment. Research assistants made reminder calls to each participant the day before data collection. On the day of the participants' appointment, research assistants looked over the consent form and questionnaires to be sure they were complete and had no missing data. Afterwards,

participants met with the lead researcher to discuss the upcoming procedures, and answer questions or concerns about the study.

Participants were instructed to wear comfortable clothing and shoes, and to eat a light meal an hour before arrival. During the 24 hours before their appointment, they were asked to avoid heavy exertion and the consumption of alcohol, but to continue to follow their normal medication regimen. If those with FM were experiencing severe symptoms, they were instructed to reschedule.

Roughly 10 to 16 participants were scheduled for each session. Blood pressure, height, weight, and waist circumference were measured before gathering in one room to receive instructions, and complete the Everyday Problems Test and Rapid Assessment of Physical Activity. Next, half of the participants were randomly assigned to first complete a series of neuropsychological tests with a trained research assistant in private rooms and the other half were randomly assigned to complete physical performance tasks first. The completion time for both cognitive and physical measures ranged from 30 to 60 minutes.

CHAPTER 3

RESULTS

It was hypothesized that higher perceived stress and lower perceived social support would be associated with increased chronic pain, as measured by the pain index from the NFAQ and pain interference in activities of daily living, in older adults with and without FM. It was also hypothesized that perceived social support would moderate the relationship between perceived stress and chronic pain among older adults with FM, but not moderate the relationship in healthy older adults. Analyses were performed using IBM SPSS REGRESSION and R for evaluation of assumptions.

Past literature has traditionally separated FM and healthy controls into separate groups (Crettaz et al., 2013; Ericsson et al., 2015; Smith et al., 2009). Therefore, the data in the present study was separated by FM status. Data were evaluated for assumptions of skewness, kurtosis, normality, linearity, and multicollinearity. For the FM group, pain and perceived stress were both slightly positively skewed, pain interference was normally distributed, and perceived social support was slightly negatively skewed. Among the non-FM group, pain, pain interference, and perceived stress were normally distributed, and perceived social support was slightly platykurtic. None of the variables in the FM and non-FM groups were transformed. No extreme univariate outliers were identified in the FM and non-FM groups, and there was no multicollinearity between variables.

T-tests were first performed between the FM and non-FM groups to evaluate for group differences in pain, pain interference, perceived stress, perceived social support, and number of comorbidities (see Table 2 for *t*-test results).

Table 2

T-Test Analysis

	FM Group		Non-FM Group		<i>t</i> -value	<i>p</i>
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>		
Participants						
Pain (NFAQ)	5.33	2.10	1.97	1.95	-7.99	.001
Pain Interference	3.26	.95	1.87	.69	-8.08	.001
Perceived Stress	21.61	7.85	10.67	7.37	-6.82	.001
Perceived Social Support	69.89	21.11	77.02	18.44	-1.70	.092
# of Comorbidities	.67	.74	1.00	.84	-2.03	.045

Note. Analysis of group differences between FM and non-FM participants.

Standard multiple regressions were performed to investigate whether the relationship between perceived stress and pain depended on one's level of perceived social support. Using the two dependent variables (DV) of pain (from NFAQ) and pain interference, multiple regressions were performed for each group. Perceived stress (PS), perceived social support (SS), and the interaction term (PS x SS) were the predictors in the model. Age was included as a covariate; however, comorbidities were not included as a covariate because they were not significantly correlated with the measures of pain. The

correlations between the variables for the FM and non-FM groups are displayed in Tables 3 and 4.

Table 3

Correlation Table for FM Group

	Age	PI	Pain	Comorbidities	PSS	SS
Age	1					
Pain interference w/ activities of daily living (PI)	.032	1				
Pain	-.025	.662**	1			
# of comorbidities (osteoporosis, RA, non-RA & migraines)	.088	.208	.153	1		
Perceived Stress Scale	-.181	.404**	.380**	-.047	1	
Social Support (Total)	-.018	-.205	-.258	.056	-.487**	1

Note: $N = 49$. ** denotes significance at the 0.01 level. * denotes significance at the 0.05 level.

Table 4

Correlation Table for Non-FM Group

	Age	PI	Pain	Comorbidities	PSS	SS
Age	1					
Pain interference w/ activities of daily living (PI)	.012	1				
Pain	-.118	.625**	1			
# of comorbidities (osteoporosis, RA, non-RA & migraines)	.059	.222	.315*	1		
Perceived Stress Scale (PSS)	-.194	.349*	.308*	.215	1	
Social Support (Total; SS)	-.133	-.215	-.371*	-.235	-.408**	1

Note: $N = 45$. ** denotes significance at the 0.01 level. * denotes significance at the 0.05 level.

Model 1 (FM Group, Hypotheses 1 and 2)

A multiple linear regression predicting pain using PS, SS, and the interaction of PS and SS was evaluated. Table 5 provides the unstandardized regression coefficients (b) and the intercept, the standardized regression coefficients (β), R^2 , and adjusted R^2 for the FM group analyses. In step 1 of model 1 using the DV of pain, the overall fit was significantly different from zero, $F(3, 45) = 3.12$, $p = .04$, $R^2 = .18$. Step 1 accounted for 18% of the variance in pain; however, SS and age did not contribute significantly to the regression. The interaction term was added in step 2 of model 1 and the overall fit was

not significantly different from zero, $F(4, 45) = 2.46, p = .06, R^2 = .19$. The direction of the relationship suggests that higher PS is associated with higher chronic pain. The relationship between chronic pain and PS was not moderated by SS, $R^2 \Delta = .01 (p = .28)$.

Model 2 (FM Group, Hypotheses 1 and 2)

A multiple linear regression predicting pain interference using PS, SS, and the interaction of PS and SS was conducted. Table 5 provides the unstandardized regression coefficients (b) and the intercept, the standardized regression coefficients (β), R^2 , and adjusted R^2 for the FM group analyses. In step 1 of model 1 using the DV of pain interference, the overall fit was significantly different from zero, $F(3, 45) = 4.17, p = .01, R^2 = .23$. Step 1 accounted for 23% of the variance in pain; however, SS and age did not contribute significantly to the regression. The interaction term was added in step 2 of model 2 and although the overall fit was significantly different from zero, $F(4, 45) = 2.63, p = .01, R^2 = .27$; age and SS did not contribute significantly to the regression. The direction of the relationships suggest that higher PS is associated with higher chronic pain but SS did not significantly moderate the relationship between PS and pain interference, $R^2 \Delta = .04 (p = .12)$.

Table 5

Regression Analysis for FM Participants

2-Step Model	Pain Index			Pain Interference		
	b	SE b	β	b	SE b	β
Step 1		N = 46			N = 46	
Age	.034	.043	.114	.027	.018	.040
PS	.104	.043	.398	.057	.018	.495
SS	-0.006	.016	-.062	.057	.018	.204
R^2		.182			.229	
Step 2						
Age	.034	.043	.116	.027	.018	.206
PS	-.028	.179	-.107	-.058	.075	-.507
SS	-.048	.058	-.485	-.035	.024	-.799
PS x SS	.002	.002	.487	.002	.001	.966
R^2		.193			.274	
ΔR^2		.011			.044	

Model 3 (Non-FM Group, Hypotheses 1 and 3)

A multiple linear regression predicting pain level using PS, SS, and the interaction of PS and SS was evaluated. Table 6 provides the unstandardized regression coefficients (b) and the intercept, the standardized regression coefficients (β), R^2 , and adjusted R^2 for the non-FM group analyses. In step 1 of model 1 using the DV of pain, the overall fit was significantly different from zero, $F(3, 40) = 2.82, p = .05, R^2 = .19$. Step 1 accounted for 19% of the variance in pain; however, PS and age did not contribute significantly to the regression. The interaction term was added in step 2 of model 3 and the overall fit was not significantly different from zero, $F(4, 40) = 2.35, p = .07, R^2 = .21$.

The direction of the relationship suggests that lower SS, instead of higher PS, is associated with greater chronic pain in older adults without FM. The relationship between chronic pain and PS was not moderated by SS, $R^2 \Delta = .02$ ($p = .34$).

Model 4 (Non-FM Group, Hypotheses 1 and 3)

A multiple linear regression predicting pain interference using PS, SS, and the interaction of PS and SS was assessed. Table 6 provides the unstandardized regression coefficients (b) and the intercept, the standardized regression coefficients (β), R^2 , and adjusted R^2 for the non-FM group analyses. In step 1 of model 1 using the DV of pain interference, the overall fit was not significantly different from zero, $F(3, 40) = 1.99$, $p = .13$, $R^2 = .14$. The interaction term was added in step 2 of model 1 and the overall fit was not significantly different from zero, $F(4, 40) = 1.55$, $p = .21$, $R^2 = .15$. These results show that PS and SS are not associated with higher pain interference. Social support was not a significant moderator between pain interference and PS, $R^2 \Delta = .01$ ($p = .56$).

Table 6
Regression Analysis for Non-FM Participants

2-Step Model	Pain Index			Pain Interference		
	b	SE b	β	b	SE b	β
Step 1		N = 41			N = 41	
Age	-.021	.033	-.100	.003	.012	.039
PS	.041	.045	.152	.028	.016	.306
SS	-.036	.018	-.338	.003	.012	.039
R^2		.186			.139	
Step 2						
Age	-.029	.034	-.135	.001	.012	.017
PS	.188	.158	.705	.061	.057	.656
SS	-.014	.029	-.131	.000	.010	.006
PS x SS	-.002	.002	-.535	.000	.001	-.339
R^2		.207			.147	
ΔR^2		.021			.008	

Additional Analysis

The measure of perceived social support was included in additional years of the parent dataset (2008, 2010, & 2012). The availability of this measure allowed for cross-sectional post-hoc regression analyses to be performed to further explore the relationship between social support and chronic pain with a larger sample size. The sample size included all first time participants across the four data collection time points (years 2008, 2010, 2012, & 2014) and consisted of 230 older adults in the FM group and 229 in the healthy control group.

Model 1 (FM Group)

FM participants were evaluated using a multiple linear regression using pain as the DV, and SS and age as predictors. The overall fit of model 1 was significant, $F(2, 212) = 6.68, p = .00$. SS significantly contributed to the model, $\beta = -.20, t(212) = -2.98, p < .01$; however, age did not contribute to the model, $\beta = -.11, t(212) = -1.67, p > .05$. The direction and strength of the relationship suggests that higher SS is related to lower pain. Social support was found to be negatively correlated to pain, $r = -.22, p < .001$.

Model 2 (FM Group)

Participants with FM were evaluated using a multiple linear regression with pain interference as the DV, and SS and age as predictors. The overall fit of model 2 was significant, $F(2, 212) = 6.19, p < .01$. SS significantly contributed to the model, $\beta = -.21, t(212) = -3.07, p < .01$ however, age did not contribute to the model, $\beta = -.09, t(212) = -1.26, p > .05$. The direction and strength of the relationship suggests that higher SS is related to lower pain interference. Social support was found to be negatively correlated to pain interference, $r = -.22, p < .01$.

Models 3 and 4 (Non-FM Group)

Multiple regression analyses were also conducted to examine the relationship between SS and chronic pain in participants without FM. Model 3 used pain as the DV with SS and age as the predictors. The results revealed that the overall fit was not significant, $F(2, 215) = .178, p > .05, R^2 = .02$. Social support was not significantly related to pain among older adults without FM. Model 4 used pain interference as the DV and SS and age as predictors; it was found that the overall fit was not significant, $F(2, 216) = .62, p > .05, R^2 = .01$. SS and age did not significantly predict pain interference.

CHAPTER 4

DISCUSSION

This study was conducted to investigate the association between perceived stress, perceived social support, and chronic pain among older adults with and without FM. Perceived social support was examined as a possible moderator in the relationship between perceived stress and chronic pain outcomes, pain level and pain interference. Hypothesis one was partially supported by the results; higher perceived stress was associated with an increase in chronic pain among older adults with FM, but not among older adults without FM. The results did not support hypothesis two; perceived social support did not moderate the relationship between chronic pain and perceived stress among the FM group. Hypothesis three was supported; perceived social support did not moderate the relationship between perceived stress and chronic pain in the non-FM group.

Perceived Stress

The results of this study show that perceived stress was related to increased FM pain and pain interference. The relationship between perceived stress and chronic pain is already fairly well-established (Gianaros & Wagner, 2015; Harris et al., 2013; Smith et al., 2009; White et al., 2014). This study provides additional support to the current literature that perceived stress is related to chronic pain and pain interference. Perceived stress has been shown to be an important factor in the occurrence and possibly the

development of chronic pain disorders (Alfven, 2011; Harris et al., 2013; Wierwille, 2012). For example, Harris and colleagues found that even minimal to moderate amounts of perceived stress contributed to the risk of developing arthritis three years later in a sample of older women. High levels of chronic perceived stress have also been found to play an important role in the expression of pain symptoms and could be more important than the experience of stressful life events (Smith et al., 2009). Stress is now being considered as much of a risk factor for the development of chronic diseases as already established factors such as obesity, nutrition, and physical exercise (Harris et al.; Smith et al.). The findings from the current study add to the body of knowledge on chronic pain conditions by providing support to establish the relationship between perceived stress and chronic pain among patients with FM.

Another demonstration of how perceived stress is related to chronic pain comes from White et al. (2014). The relationship between pain intensity, pain interference, and perceived stress was assessed, and it was found that higher perceived stress was linked to greater odds of moderate to severe pain intensity and interference. The results from the present study are consistent with White et al.'s findings. Results from the current study are also in line with findings from Smith et al. (2009). Smith and colleagues found that perceived stress was associated with poorer physical health in both individuals with FM and a healthy control group, but it is important to note that women with FM did report significantly higher perceived stress than the controls. Based on the findings of their study, Smith et al. identified FM symptoms as stress-related. The present study supports that notion and adds to past research conceptions that chronic pain disorders may be affected by the experience and perception of stressors.

In the present study, the relationship perceived stress has with chronic pain among individuals with FM was not the same among older adults without FM. The finding suggests that healthy older adults are able to better manage their perceptions of stress, which lessens the effects of stress on their health. Another possible explanation is that participants without FM reported significantly less pain and stress than those with FM, indicating that perceived stress would not play as large of a role in their general health. This idea is supported by the findings from Martin et al. (1993), who found significantly lower amounts of perceived stress among healthy controls when compared to those with chronic headaches.

Perceived Social Support

Post-hoc correlations were conducted for each subscale of perceived social support, which consisted of tangible, emotional and informational, positive social interactions, affectionate, and “to what extent do you have someone to do things with to help you get your mind off things”. The subscales were not found to be correlated with chronic pain or pain interference. Total social support was significantly correlated with pain ($r = -.37, p < .05$). Conversely, total social support was not significantly correlated to pain interference but approached significance ($r = -.22, p = .08$). As supported by studies that used overall social support (Ferreira-Valente et al., 2014; Lopez-Martinez et al., 2008; Oliver et al., 2001), this shows that total social support might be more meaningful to look at because it incorporates all types of social support. On the other hand, some studies have shown that tangible and emotional support could be the more

important components of perceived social support (Martin et al., 1993; Montoya et al., 2004).

When first evaluating the FM and non-FM groups for differences, it was found that perceived social support was not significantly different between groups. Older adults with and without FM had very similar levels of overall support, and further analysis of the individual subscales did not reveal any significant differences. Although it was not part of the original hypotheses, perceived social support was examined in terms of the variance the measure accounted for in the experience of pain and pain interference. It was found that perceived social support did not account for variance in levels of chronic pain among those with FM. Yet, when additional cross-sectional analyses were performed for perceived social support, it was found that lower levels of perceived social support were significantly related to higher chronic pain and pain interference.

All four data collection years of the parent longitudinal study included the measure of perceived social support measure, allowing for additional analyses to further explore the relationship between social support and FM. It was found that perceived social support was associated with chronic pain. Older adults with FM status tended to have lower overall perceived social support when they were experiencing greater amounts of chronic pain. Experiencing higher perceived social support was also associated with lower pain interference among older adults with FM. While exploring the relationship older adults without FM had with perceived social support, it was found that perceived social support was not related to the experience of chronic pain or pain interference.

These findings could be related to the idea that perceived social support is most important when older adults are experiencing new pain, and not when older adults have had time to adjust and cope with pain. Support for this comes from the results of the present study. Although perceived social support was not found to contribute to the experience of chronic pain in older adults with FM, it did show a significant association with pain in participants without FM. This finding could demonstrate that social support in non-FM older adults might be more important than in older adults who have been dealing with chronic pain for an extended period of time.

Older adults diagnosed with FM have typically been coping with chronic pain for much longer and have habituated to the experience of widespread pain. In older adults' experience of new pain, perceived social support could be a more meaningful coping mechanism (Cohen et al., 2015; Farin et al., 2013; Lopez-Martinez et al., 2008). Boggero and colleagues (2015) suggested that since older adults could be more adept at coping with pain, the levels of perceived social support may not be influential enough to play a role among those dealing with chronic pain for a great deal of time. However, contradicting what Boggero et al. suggested, a qualitative study on pain in aging over time found that most older adults cope with pain using medication instead of more active and positive coping strategies (Pelegrin et al., 2014).

It is important to study the influence of perceived social support because it is related to quality of life and has been shown to influence health (Haber et al., 2007; Kahn et al., 2003; Leadly et al., 2013). Levels of perceived social support can affect aspects of one's life including symptoms of anxiety and depression, which leads to lower quality of life (Mundal et al., 2014; Rzeszutek et al., 2015). Wierwille (2012) reviewed how quality

of life is affected among older adults with a diagnosis of FM. Lower quality of life limits social interactions and one's ability to perform everyday activities. FM has not been found to be directly related to mortality, instead it is the lifestyle of older adults with FM that can raise the risk for mortality. Meaning, if one's social life and interactions are lessened and individuals are not able to perform daily activities, then their chances of death increase.

Another study reviewing quality of life and chronic pain was conducted by Leadley et al. (2013). The study reviewed quality of life data and its relationship with chronic pain. It was found that pain severity was strongly correlated with quality of life. The authors inferred that chronic pain patients who can successfully reduce their pain severity could increase quality of life, therefore increasing lifespan. The symptoms of FM create barriers for those diagnosed, which can impair social functioning, decrease perceived social support, and in turn lead to lower quality of life (Farin et al., 2013).

Perceived Stress and Perceived Social Support

Perceived social support did not moderate the relationship between perceived stress and pain or pain interference. As shown by the results, perceived stress was related to chronic pain more than the other variables included in the study, but perceived social support was not. The results most likely stemmed from the findings that FM and non-FM groups did not significantly differ on the measure of perceived social support. The results are consistent with a study by Harris et al. (2013), which, as a secondary aim, examined the influence of perceived social support on the relationship between perceived stress and the onset of arthritis. The researchers had predicted that social support could help to ameliorate the negative effects of perceived stress in predicting the onset of arthritis. The

results from Harris et al. revealed no interactional effects of social support as a moderator. In the present study, perceived stress could have been too influential, in that it took up a large portion of the variance in the regression model (18%), to show how perceived social support interacts in individuals with FM.

Although Martin et al. (1993) did not test the moderation effect of perceived social support on perceived stress and chronic headache sufferers, the study did examine the relationships between perceived stress, perceived social support, and chronic pain. It was found that chronic headache sufferers were less satisfied with perceived social support, meaning that participants believed less social support was available to them. Findings from that study demonstrated that perceived stress was higher in those with chronic pain versus the healthy control group. Also, when participants' headaches became worse, the higher their perceived stress became. The findings from Martin et al. support some of the findings from the current study, but it is outdated and the research needs to be expanded to different types of chronic pain disorders.

Chronic pain, perceived social support and perceived stress should be studied further because post-hoc analyses found that perceived stress and perceived social support were negatively correlated in older adults with FM ($r = -.52, p < .001$). Again, that finding provides more support that those who have chronic pain tend to perceive their availability of social support as lower, and have higher reported perceived stress. Even though the results of this study were not significant for the moderating effects of perceived social support, other studies have proposed that perceived social support could be a strong indicator of health and contribute to illness. Harris et al. (2013) found that social support did not modify the adverse effects of perceived stress in the onset of

arthritis among older women. However, the authors suggested that perceived stress and perceived social support are acting as independent psychosocial factors in the risk for developing chronic pain, and the effects of perceived stress could be more important.

The stress-buffering model suggests that the negative effects of stress on pain could be lessened with social support (Lopez-Martinez et al., 2008). Cohen et al. (2015) suggested that perceived social support could protect against stress-elicited diseases. The study assessed how perceived social support could help to lessen the stress-effects from daily tension and in turn prevent illness. The authors found that social support and interpersonal stress were associated with signs of illness. Studying a stress-buffering model among FM sufferers could be beneficial since higher stress and stressors are associated with FM. The stress-buffering hypothesis needs to be investigated more among older adults with FM, as well as other chronic pain disorders. The limited amount of studies looking at the influence of perceived social support on perceived stress and chronic pain makes it difficult to draw definitive conclusions from the current study.

Limitations

This study used data from the data collection year of 2014 in a study on the physical and cognitive status of people aged 50 and over with and without FM. One limitation was that no measure for perceived stress was included in the longitudinal data collection years of 2008, 2010, and 2012. Due to this, there was not a large enough sample size ($N_{\text{FM}} = 49$, $N_{\text{non-FM}} = 45$) to have an accurate view of the relationship between perceived social support, perceived stress, and chronic pain among older adults with FM. Although cross-sectional data from other years of the longitudinal study were used to broaden analysis of perceived social support, no larger conclusions could be drawn for

the possible moderation effect of perceived social support and its interaction with perceived stress and chronic pain.

In regards to the perceived social support measure, the difference between older adults with and without FM was not very large ($M_{\text{FM}} = 69.89$, $M_{\text{non-FM}} = 77.02$). Since there was no significant difference found between groups on the total score or subscales of perceived social support, it did not allow for perceived social support to contribute to the variability between groups, or account for enough variance in the regression models. Past research has indicated that individuals with higher levels of pain tend to have lower perceived social support (Jensen et al., 2011; Lopez-Martinez et al., 2008). However, this tendency was not observed in the present study's sample even though the participants with FM did have significantly more pain and pain interference than older adults without FM.

Another limitation of this study is the disproportionate amount of male to female participants in the sample of older adults with an FM diagnosis. In the FM group there was roughly one male per every 11 females versus about one male for every two females in the control group. Given that FM is more prevalent among women, several researchers have used samples of only women (Ferreira-Valente et al., 2014; Harris et al., 2013; Smith et al., 2009). Kawachi and Berkman (2001) found that women tend to experience higher psychological distress and lower perceived social support. Another study by Sanders and Slade (2011) found that in chronic orofacial pain patients, men were less sensitive to the effects of perceived stress associated with pain symptoms. Sex differences could have occurred in the sample and should have been examined further and possibly used as a covariate in future analyses with larger sample sizes.

Future Research

Although several studies have looked at the influence of perceived social support on chronic pain and perceived stress (Harris et al., 2013; Martin et al., 1993), the present study was the first to explore the relationship among older adults with FM. Overall, this study contributed to the body of knowledge on how psychosocial factors interact with FM. The results of this study provide more support to the understanding that perceived stress is an important factor in the experience of chronic pain. Perceived social support could also be an important factor but more research is needed to examine that possibility. This study has depicted the complicated nature of perceived social support among older adults with and without FM.

The present study highlights the need for more research on social support. There were different findings on perceived social support and pain in the analysis from data collection year 2014 versus cross-sectional analyses of all first time participants across four years of data collection (2008, 2010, 2012, & 2014), indicating that perceived social support research should be broadened to also look at the influence of positive coping skills. Higher perceived social support has been found to be related to better coping skills among those with chronic pain (Cohen et al., 2015; Lopez-Martinez et al., 2008).

Another example of this comes from Boggero et al. (2015). The researchers found that pain intensity moderates the relationship between age and pain interference in patients with chronic orofacial pain. When compared to younger adults with chronic pain, older adults with higher pain intensity had less pain interference. This study suggests that older adults are more resilient to pain interference when pain intensity increases. The authors discussed that coping mechanisms could play a role in how older adults are able

to maintain their daily activities. Based on the results of Boggero et al., higher perceived social support could be viewed as part of the coping mechanisms employed among older adults with chronic pain.

Several researchers investigating FM have conducted longitudinal or cross-sectional studies (Ferreira & Sherman, 2007; Harris et al., 2013; Mundal et al., 2014). The factors affecting FM are not always consistent over time and the results from studies using years of data or multiple cohorts could reveal more about the disease process. The complex relationship of FM-related factors could be better explored. Specifically, with social support, bigger sample sizes and including a larger range of ages in a study would allow researchers to see whether perceived social support changes over time in older versus middle-aged adults with FM. Also, the development and management of FM and related symptoms could be observed more intensely.

Future research studies should consider observing physiological reactions in addition to psychosocial factors. Martinez-Lavin (2007) conducted a review and found that there tends to be autonomic nervous system (ANS; i.e. stress response system) dysfunction among those with FM. When dysfunction of the ANS occurred among patients with FM, pain responses and tenderness tended to increase. It was also suggested that the hyperactivity of the ANS could prevent those with FM from responding appropriately to stressors, leading to the symptoms of chronic fatigue and muscle stiffness. Excessive activation of the sympathetic nervous system could lead to the comorbid symptoms of FM including sleep dysfunction, anxiety, and Raynaud's phenomenon, a reaction to cold or stress, causing blood vessels to constrict in the hands

and feet (Martinez-Lavin, 2007). Thus, studying physiological responses could provide evidence for contributory factors in the pathophysiology of FM syndrome.

Another area for future research to expand on is the investigation of interactional effects of comorbid symptoms and disorders. Although research has explored some comorbidities associated with FM (Harris et al., 2013; Mundal et al., 2014; Smith et al., 2009; Wierwille, 2012), how comorbidities interact with known FM symptoms is lacking in chronic pain research. The relationships between comorbidities and psychosocial and biological factors are not simply one-directional, and most likely have multi-directional relationships with each other. In the present study, there were significant group differences observed between FM and non-FM groups on measures of comorbidities including migraines, osteoporosis, rheumatoid arthritis, and non-rheumatoid arthritis. This shows that perhaps factors related to comorbidities also play a role in FM and symptomatology.

Additionally, post-hoc analyses examining a measure of depression revealed that depression was prevalent in the sample, proposing that the experience of depression could also be related to pain. In particular, the FM group had a much higher mean depression score ($M = 15.72$) compared to the non-FM group ($M = 4.78$). Past literature has examined the influence of depression among individuals with FM and noted how perceived social support could help protect against the experience of depression (Cohen et al., 2015; Kawachi & Berkman, 2001). However, this relationship has not been studied explicitly with FM patients. Wierwille (2012) noted that while research has observed the occurrence of heightened depression, anxiety, and other chronic pain conditions (e.g. rheumatoid arthritis) in FM, researchers are still uncertain of their relationship with the

manifestation of FM. Studying these interactions and associations in FM could add to the current body of knowledge on chronic pain. As FM research progresses, findings on psychosocial factors and health outcomes should be utilized for treatment plans.

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