Correlates of Exercise Self-efficacy in Older Adults with Arthritis

by

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A Thesis Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Science

Approved November 2016 by the
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ARIZONA STATE UNIVERSITY

December 2016

ABSTRACT

Purpose: This study explored the potential correlates of exercise self-efficacy among older adults with a self-reported diagnosis of arthritis. Methods: This study was a secondary data analysis and used a cross-sectional design. Data was collected from a convenience sample of Non-Hispanic White and Non-Hispanic Black individuals between 2006-2008 (*N*=208). Descriptive statistics were run to assess means and frequencies within the sample. Bivariate statistics (Pearson and Spearman correlations, T-tests and one-way analysis of variance) were run to examine relationships between the independent and dependent variables. Multiple linear regression analyses were conducted to examine independent predictors of self-efficacy for exercise (SEE) and barriers self-efficacy for exercise (BSE). Results: Participants were predominantly female (85.6%), white (62.9%), retired (58.1%) and had a mean age of 66.6 [10.7] years. For education level, 23.4% reported a Master's degree or higher and 18.6% reported they had at most a high school degree or GED. Nearly 47% of the sample were classified as obese based on self-reported body mass index (BMI) and 68.3% of the sample were not meeting the American College of Sports Medicine physical activity (PA) recommendations. Participants reported a relatively high BSE (22.6) and an average SEE (22.7). Significant positive associations were seen with outcome expectation for exercise (EOE), social support, and total minutes of PA and negative associations with BMI, physical function, pain, and negative affect with SEE and BSE. Meeting the PA guidelines ($t_{134.5}$=4.60, 95%CI= 4.7(6.71-2.68), p<0.001) and being white (t_{164}=2.82, 95%CI=2.82(0.57-5.08), p=0.014) were associated with SEE and BSE (t_{165}=3.42, 95%CI= 4.37(6.89-1.85),

p=0.001) and (t_{164}=2.34, 95%CI= 2.95(0.46-5.43), p=0.021), respectively. In regression analyses, significant predictors of SEE were education (p=.006), physical function (p=.006) and EOE (p<.001). Significant predictors of BSE were physical function (p=.020), social support (p=.031), EOE (p=<.001), education level (p=.037), and total minutes of PA (p=.022). The variables in the SEE model accounted for 50.5% (R=.737, R^2=.505) of the total variance and the variables in BSE model accounted for 41.1% (R=.672, R^2=.411) of the total variance of the model. Discussion: EOE appears to be an important predictor of SEE and BSE. Examining the temporal relationship between EOE and SEE is warranted.

DEDICATION

I dedicate this thesis to my loving family, my wonderful boyfriend, and all my influential Master's colleagues that I befriended along the way. Without their push I would have never been inspired to explore this tumultuous journey of writing a thesis. Thank you for making me write. In loving memory of Nicole Dennion.

ACKNOWLEDGMENTS

I would like to thank my amazing mentor Dr. Cheryl Der Ananian for taking this project on with me. I appreciate her patience, honesty, and willingness to teach. Through this last year I have learned an incredible amount about correlates to physical activity, not only amongst people with arthritis, but in many different populations. Without her viewpoint I would have never been able to perceive correlates the way I do now.

I would also like to thank my committee members. Dr. Ann Sebren has been there every step of the way to guide me and help me with any questions I had. I am also thankful for the feedback that Dr. Shawn Hrncir has given me and her encouragement throughout this entire process. Being able to work with such an amazing committee makes me thankful for the opportunity Arizona State University has given me during my Master's education.

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INTRODUCTION

There is a substantial public health burden associated with arthritis in the United States (US). Currently, one in five US adults (53 million) report a diagnosis of arthritis, and its prevalence is expected to increase as the US population ages (Nelson, Rejeski, Blair, Duncan, Judge, King, Macera, & Castaneda-Sceppa, 2007). Originally, it was estimated that nearly one in four adults (nearly 67 million) would have a diagnosis of arthritis by 2030 (Cheng, Hootman, Murphy, Langmaid, & Helmick, 2010). However, updated statistics have increased this projection by 49%, estimating 78.4 million US adults will have a diagnosis of arthritis by 2040 (Hootman, Helmick, Barbour, Theis, & Boring, 2016).

The most common type of arthritis in the US is osteoarthritis (OA) (Centers for Disease Control and, 2015). In 2005, there were 28 million adults with a medical-diagnosis of osteoarthritis (Centers for Disease Control, 2015). Moreover, 80% of people with OA report some type of activity limitation due to the debilitating nature of the disease (Ogden, Lamb, Carroll, & Flegal, 2010).

Arthritis disproportionately affects older adults but is also increasing in middle-aged individuals. Adults over the age of 65 account for nearly 50% of all cases of arthritis while individuals between the ages of 45-64 account for nearly 33% of all cases of arthritis(Helmick, Felson, Lawrence, Gabriel, Hirsch, Kwoh, 2008). Women with arthritis account for 60% of the total cases of arthritis in the US (Helmick et al., 2008; Barbour, Helmick, Theis, Murphy, Hootman, & Brady, 2013). The prevalence of arthritis is higher in Non-Hispanic white (NHW) and Non-Hispanic black (NHB) adults compared to

Hispanic adults. However, Hispanics are burdened with higher disability rates and activity limitations compared to NHW individuals (Helmick et al., 2008; Hootman, Bolen, Helmick, Langmaid, ..CDC, 2006).

The prevalence of arthritis and the severity of the disease increases when a person has one or more comorbidities (e.g. heart disease, Diabetes Mellitus, obesity) (Nüesch, Dieppe, Reichenbach, Williams, Iff, & Juni., 2011). Among individuals with obesity (BMI>30m^2/kg), 28.9%-35.6% report arthritis (Hootman et al., 2006). Similarly, among individuals with diabetes mellitus, 16% (7.3 million) report arthritis (Helmick et al., 2008; Hootman et al., 2006). The current epidemic of obesity may increase the number of middle-age adults who have a medical diagnosis of arthritis; thereby increasing the public health burden and cost of arthritis throughout the entirety of the life span (Trogdon, Murphy, Khavjou, Li, Maylahn, Tangka,…Orenstein., 2015; Centers for Disease and Control, 2015).

Arthritis has a substantial impact at both the individual and societal level. At the individual level, arthritis-related symptoms include pain, stiffness, activity limitations and/or disability, decreased physical function, decreased quality of life, and increased mental health diseases (i.e, depression, anxiety, etc.) (Ettinger, Burns, Messier, Applegate, Rejeski et al., 1997; Wilcox, Der Ananian, Sharpe, Robbins, & Brady., 2005) The effects of arthritis vary depending on the progression and severity of disease, and the age of onset. Negative implications of the disease also can vary based on a person's coping mechanisms and management strategies throughout the progression of the disease (Murrock, 2005; Gyursik et al., 2009).

Arthritis is the leading cause of disability in adults in the United States (Centers for Disease and Control, 2015). Currently, 22.7 million people report an arthritis-related activity limitation (Centers for Disease and Control, 2015). As the prevalence of arthritis increases due to the aging population, arthritis-related activity limitations are also expected to rise. By 2040, 52% (34.6 million) of adults with arthritis are anticipated to have an activity limitation that impedes activities of daily; in lieu decreasing quality of life (Hootman et al., 2016).

Mental health concerns are more common among individuals with arthritis and older adults (Nelson et al., 2007; Takacs, J., 2014). There is an 18.1% attributable risk of depression associated with arthritis, and 7% of individuals with arthritis report severe psychological distress symptoms (Hootman & Cheng., 2007; Dunlop et al., 2011). People with arthritis who do not incorporate regular exercise behaviors are two to three times more likely to report chronic pain and impaired quality of life (Hootman & Cheng., 2007). Moreover, OA may also be associated with increased mortality due to the debilitating nature of the disease. All –cause mortality was found to be higher in people with OA compared to the general population; especially among those with co-morbidities (Nüesch et al., 2011).

Because of the effects of arthritis on pain, function, disability, and decreased quality of life, arthritis places a substantial burden on society and the healthcare system. The total personal and societal costs for chronic treatment, hospital visits, and pain management costs in 2005 were 353 billion dollars (Cisternas, Murphy, Yelin, Foreman, Pasta, & Helmick, 2009). This increased from 1997 by 100 million dollars (Cisternas et al., 2009). Out-of-pocket cost for people with arthritis increases linearly throughout the

duration and progression of the disease. Estimate costs range from $1513 per year to a maximum yearly cost up to $20,527 (Lapsley, March, Tribe, Cross, Courtenay, & Brooks, 2002).

Individuals with arthritis interact with the healthcare system on a consistent basis for acute and chronic treatment. Data collected from the 2005 National Health Care Survey indicated there were 100 million ambulatory health care visits from individuals with arthritis: 84% of these visits were to a primary care physician, 6% of the visits were to an outpatient acute care, and 5% were visits to the emergency department (Helmick et al., 2008; Helmick & Watkins-Castillo, 2016).

Joint replacements and total knee arthroplasty (TKA) are common procedures in adults with osteoarthritis contributing to the high healthcare costs associated with this disease. Without these procedures, arthritis patients complain that pain inhibits quality of life (Losina, Patiel, Weinstein, Yelin…Katz, 2015). The cost of TKA alone can range from $50,000 to $57,000 (Losina et al., 2015). The total price including hospital stay and rehabilitation therapy for the knee replacement can drive this number up significantly. Although cost is high, TKA has known benefits including: improved quality of life, increased physical function and mobility, overall daily pain (not including post-surgical recovery time), and reduced stiffness in the replaced joint (Losina et al., 2015). High risk (end stage knee osteoarthritis) patients report higher improvements in QOL scales and improved function versus low risk osteoarthritis patients status post a TKA procedure (Losina et al., 2015). From the data shown, research needs to focus on identifying more cost-effective ways to delay the progression and severity of OA.

Although severe cases of arthritis lead to procedural treatment, it is at the end-stages of arthritis. Arthritis is a gradual disease. With early diagnosis and aggressive interventional treatments are prescribed, arthritis can be managed. Exercise is considered a cornerstone in the management of various types of arthritis by numerous medical and public health organizations (American College of Sports Medicine & Pescatello, 2014; Ettinger et al., 1997; U.S. Department of Health and Human Services, 2000; Shih, Hootman, Kruger, Helmick, 2006; Suomi & Collier, 2003; Nelson et al., 2007). Exercise is known to improve arthritis-specific outcomes including pain, physical function, stiffness, health-related quality of life, mental health illnesses, and delays in the onset of disability (Centers for Disease and Control, 2015; Wilcox et al., 2003). These arthritis-specific health benefits are in summation to the general health benefits seen with exercise and an active lifestyle (American College of Sports Medicine & Pescatello, 2014; Ettinger et al., 1997; U.S. department of health and human services, 2000; Shih, Hootman, Kruger, Helmick, 2006; Suomi & Collier, 2003; Nelson et al., 2007; Fontaine, Heo, Bathon, 2004).

Despite the numerous benefits of exercise for people with arthritis, individuals with arthritis are less likely to meet current recommendations for physical activity. Song and colleagues (2013) examined the proportion of African-Americans and White individuals with knee OA who were meeting physical activity recommendations using accelerometry. Findings from this study suggested African-American individuals were 90% less-likely to meet the physical activity guidelines compared to White individuals. After controlling for other factors known to be associated with physical activity participation (i.e. income level, education level, depressive symptoms,

overweight/obesity, and knee pain), African-Americans were still 76% less likely to meet the physical activity limitations (Song et al., 2013).

Previous studies using self-reported PA data, also suggest people with arthritis are less-likely to meet PA recommendations. Shih and colleagues found that nearly 37% of individuals with arthritis were inactive compared to 23.7% of adults without arthritis (Shih et al., 2003). Similarly, per Fontaine and colleagues, 60% of people with doctor-diagnosed arthritis are not meeting the ACSM physical activity recommendations for the general population (Fontaine et al., 2004). Understanding the factors that influence exercise participation is critical for designing interventions and promoting physical activity in people with arthritis to facilitate management of arthritis.

Numerous factors influence physical activity participation in people with arthritis. Similar to the general population many sociodemographic characteristics including age, gender, income/education level, and BMI are all associated with exercise participation (Shih et al., 2006; Der Ananian et al., 2015; Song et al., 2013; Wilcox et al., 2005). Among individuals with arthritis physical activity participation decreases with age, especially after the age of sixty-five (Song et al., 2014; Shih et al., 2006., Peek & Coward, 1999). Males are more likely to meet the general physical activity recommendations than females and Non-Hispanic White individuals are more likely to meet physical activity recommendations than Hispanics and Non-Hispanic Black individuals (Nelson et al., 2007; Song et al., 2013; Der Ananian et al., 2015; Hootman et al., 2016). Lower socioeconomic status along with high BMI ($30m^2/kg$) have also been shown to be associated with decreased physical activity participation (Nelson et al,. 2007; Helmick et al., 2016; Hootman et al., 2016; Hootman et al., 2003; Shih et al., 2006).

Other symptoms specific to arthritis (i.e. pain and decreased physical function) contribute to lower physical activity levels (Wilcox et al., 2005; Shih et al., 2006; Song et al, 2013). Anticipated pain from exercise participation, anxiety/depression, social limitations, lack of special equipment for safety, and joint pain are reported as salient exercise barriers among individuals with OA (Shih et al, 2006). Similarly, in a comprehensive review of literature, conducted by Wilcox and colleagues (2005), perceived pain, fatigue, impaired mobility, and other comorbid conditions were identified as salient barriers to exercise participation in people with arthritis (Wilcox et al., 2005). Access to exercise facilities or trainers with knowledge for arthritis management have been shown to be barriers for exercise participation (Gyurcsik, Brawley, Spink, Brittain, Fuller & Chad, 2009; Shih et al., 2006; Wilcox et al., 2005). Gyurcsik and colleagues (2009) found that 50% of the sample reported arthritis-specific pain as a barrier or limitation to exercise in an open-ended self-report measure. Numerous psychosocial factors influence exercise participation in people with arthritis. Past physical activity levels, social support, environment, education of arthritis-specific exercises, class availability, facility accessibility, means of transportation, all affect exercise participation within people who have arthritis. Individuals with lower past physical activity levels and limited resources display lower rates for physical activity participation (Song et al., 2016; Wilcox et al., 2005).

Among individuals with arthritis, self-efficacy is one of the strongest correlates of exercise participation (Hootman & Cheng, 2007; Nelson et al., 2007; Gyurcsik et al, 2009; Wilcox et al., 2005). Self-efficacy for exercise (SEE) is defined as an individual's

belief in one's ability to successfully participate in exercise. Self-efficacy may also be associated with perceived pain and physical function, both of which influence exercise participation. In a study by Sharma and colleagues, higher self-efficacy was associated with lower pain scores from baseline to a 3 year follow up in older adults with knee OA (Sharma, Cahue, Song, Hayes, Pai, & Dunlop, 2003). Similarly, lower self-efficacy was associated with lower physical functioning (Sharma et al., 2003). Studies have suggested that self-efficacy is the strongest predictor for exercise in people with arthritis, but little is known about the correlates of self-efficacy in this population (Gyursik et al., 2009).

Identifying strategies and interventions that enhance self-efficacy is critical for promoting physical activity participation through enhanced SEE. Few studies have systematically addressed the factors the promote self-efficacy for exercise. In a recent meta-analysis, Ashford and colleagues examined what types of interventions increased self-efficacy for physical activity (Ashford, Edmunds, & French, 2010). After analyzing 27 physical activity interventions, they found verbal persuasion had the strongest effect on self-efficacy ($p<0.001$) (Ashford et al., 2010). Barriers for physical activity had a negative association with self-efficacy ($p<0.01$) (Ashford et al., 2010). To date, there have not been any studies examining correlates, predictors or determinants of exercise self-efficacy in people with arthritis despite its known association with exercise participation. Gyurcsik and colleagues (2009) addressed self-regulation and coping mechanisms for exercise in women with arthritis, and they measured barrier frequency. They found that women with less progressive arthritis have higher self-efficacy and self-regulation for physical activity (Gyursik et al., 2009). For future research, they recommend delving into self-efficacy theory and cognitive behaviors to understand what

can overcome the arthritis specific barriers (Gyursik et al., 2009). Understanding these factors, using self-efficacy theory as the guiding framework, may contribute to the development of more effective physical activity intervention in people with arthritis.

Theoretical Framework

Self-efficacy is defined by Bandura as "beliefs in ones capabilities to organize and execute courses of action required to produce attainments," (Bandura, 1997). Per Bandura, there must be efficacy and psychological manifestations present to change behavior (Bandura, 1997). The strength of a person's belief that they can complete a task is based on how the person perceives the task. If a person perceives a task as difficult or unattainable, subjectively, then there will be lower self-efficacy for that task. A person must know their potential to complete the behavior or task, and how threatening the task can be for them. Bandura concluded that efficacy to perform a task is a vital component in completing a task or behavior (Bandura, 1977). According to theory, self-efficacy is developed by numerous factors that enhance the ability to participate or complete a task: performance attainment, vicarious learning, verbal persuasion, emotional arousal, and physical states (Bandura, 1997). To date, how these factors contribute to the development of exercise self-efficacy has not been studied in people with arthritis. Therefore, the purpose of this study was to examine potential demographic, arthritis-related physical and psychosocial correlates of exercise self-efficacy and barriers to self-efficacy with exercise in adults with arthritis using self-efficacy theory as the underlying framework (Bandura, 1997).

Research Aims and Hypotheses

Specific Aim 1. To explore the associations between sociodemographic characteristics (age, sex, race, income/education level), adverse physical states (pain, impaired physical function, obesity), adverse emotional states (negative affect), exercise outcome expectations, social support for exercise, and physical activity with self-efficacy for exercise (SEE).

$H1_A$: Higher social economic status(SES), as indicated by education level, the male sex, and Non-Hispanic White race will be positively associated with SEE

$H1_0$: There will be no associations between SES, sex, or race with SEE.

$H2_A$: Impaired/low physical function, higher pain levels, and negative affect will be negatively associated with SEE.

$H2_0$: There will be no association between impaired/low physical function, pain, or negative affect with SEE.

$H3_A$: A higher level of social support for exercise and higher perceived outcome expectations will be positively associated with SEE.

$H3_0$: There will be no association between social support or outcome expectations with SEE.

$H4_A$: Past physical activity levels will be positively associated with SEE.

$H4_0$: There will be no association with past physical activity levels with SEE.

Specific Aim 2. To explore the associations between sociodemographic characteristics (age, sex, race, income/education level), adverse physical states (pain, impaired physical

function, obesity), adverse emotional states (negative affect), exercise outcome expectations, social support for exercise, and physical activity with barriers self-efficacy(BSE).

$H1_A$: Higher social economic status, as indicated by education level, the male sex, and the Non-Hispanic White race will be positively associated with BSE.

$H1_0$: There will be no associations between SES, sex, or race with BSE.

$H2_A$: Impaired/low physical function, higher pain levels, and negative affect will be negatively associated with BSE.

$H2_0$: There will be no association between impaired/low physical function, pain, or negative affect with BSE.

$H3_A$: A higher level of social support for exercise and higher perceived outcome expectations will be positively associated with BSE.

$H3_0$: There will be no association between social support or outcome expectations with BSE.

$H4_A$: Physical activity levels will be positively associated with BSE.

$H4_0$: There will be no association with past physical activity levels with BSE.

Specific Aim 3. To explore the independent predictors of SEE and BSE through multiple regression analyses**.**

H_o: After controlling for other variables in the model, sociodemographic characteristics, physical states, emotional states, psychosocial

characteristics, and physical activity will not independently predict SEE or BSE

Limitations

The primary limitation for this study is that it is a secondary data analysis of a study conducted to examine potential correlates of exercise participation in individuals with arthritis. The original study was a cross-sectional study and temporal sequence cannot be determined. All data obtained in this study was obtained via self-report using valid and reliable scales. Self-report data can over or under-estimate true values and is known to have social desirability bias. Finally, some responses of pertinent data necessary for data analysis were not completely answered, and had to be omitted from the study. Socioeconomic status was inferred per education level because participants did not answer income level demographic question.

Delimitations

This study was delimited to persons with a self-report of a physician medical diagnosis of OA. Delimitation was to NHW and NHB over the age of fifty in the Chicago-area. This may not be generalizable to the general population of the US.

Terminology

Arthritis: A physician diagnosed degenerative joint disease that can affect one or multiple musculoskeletal systems of the body.

Non-Hispanic White (NHW): Self-reported categorization of a person with Caucasian descendants with no Hispanic heritage.

Non- Hispanic Black (NHB): Self-reported categorization of a person with African-American descendants with no Hispanic Heritage.

Osteoarthritis: One of the most common forms of arthritis that occurs by the breakdown of the protective cartilage of the bone; most commonly in knees, hips, hands, and spine.

Meeting Exercise Recommendations: The American Heart Association and American College of Sports Medicine recommendations for physical activity were used to determine whether participants met the physical activity recommendations. Specifically, participants had to participate in moderate intensity aerobic exercise on at least 5 days a week for 30 minutes or vigorous intensity 3 times a week for 20 minutes.

Physical Function: The ability to perform an activity without disability or pain.

Activity-Limitation: Physical restriction to the performance of an activity.

Self-Efficacy: beliefs in ones capabilities to organize and execute courses of action required to produce attainments.

Barriers self-efficacy (BSE): the confidence in one's ability to engage in exercise in the presence of barriers.

Self-efficacy for Exercise (SEE): defined as the confidence in one's ability to exercise.

CHAPTER 2

LITERATURE REVIEW

Arthritis Prevalence

Background. Arthritis is a degenerative joint disease that affects 47-50 million adults in the United States (Centers for Disease and Control, 2015; Helmick et al., 2008; Helmick & Watkins-Castillo, 2016). Currently one in five adults has a medical diagnosis of some form of arthritis (Hootman et al., 2016; Centers for Disease and Control, 2015). It was initially projected that there would be a 40% increase in the number of individuals with arthritis by 2030, resulting in 67 million people with a medical diagnosis of arthritis (Hootman et al., 2016; Hootman & Cheng, 2007). However, a more recent projection by Hootman and colleagues (2016) estimates that 78 million people will have a diagnosis of arthritis by 2040. This projection is an increase of 49% from the original, 2006, projection of 67 million people by 2030. The increased prevalence projection was primarily attributed to primarily attributed to the aging population (Hootman et al., 2006; Hootman et al., 2016).

Sociodemographic Characteristics

Age/gender. The growth of the aging population and an increased prevalence of are contributing to the increased projections of the prevalence of doctor-diagnosed arthritis (Cheng et al., 2010). By the year 2030, the entire baby-boomer generation is predicted to be 65 and older (Barbour et al., 2013). Barbour and colleagues (2013) estimated the prevalence of doctor-diagnosed arthritis within the current US population using data from the 2010-2012 National Health Interview Survey (NHIS). The proportion of individuals with arthritis increased with age and was higher in females than

males. In adults over the age of 65, the prevalence of arthritis was higher in women than men across all age groups. In adults between the ages of 65-74, 41.6% of men and 53.1% of women reported arthritis. Similarly, in adults between the ages of 75-84, 46% of men and 55.2% of females. Finally, among individuals 85 and older, 48.6% of men and 57.1%of women had arthritis (Barbour et al., 2013). Proportionally, people aged 65 and older have a higher prevalence of arthritis (49.7%) compared to young and middle aged-adults (Shih et al., 2006) and females have a higher risk of developing arthritis than males at every age strata. The reasons for the discrepancies between males and females is not well understood.

Race. Racial and ethnic disparities exist in terms of the prevalence and consequences of arthritis. Arthritis affects more NHW and NHB individuals than Hispanic individuals or individuals of other races (Dunlop et al., 2008). In a recent analysis of 2010-2012 NHIS data, 25.9% of NHW individuals and 21.3% of NHB individuals reported a doctor's diagnosis of arthritis (Barbour et al., 2013). In comparison, and only 12.1% of Hispanic individuals reported a doctor's diagnosis of arthritis (Barbour et al., 2013). Access to healthcare and the fact that the Hispanic population in the US is younger may be influencing the prevalence data. It is anticipated the prevalence of arthritis will increase as the Hispanic population ages.
Differences in arthritis attributable-activity limitation (AAAL) by race and ethnicity was also examined in the study by Barbour and colleagues (2013). Out of the 25.9% NHW individuals with a doctor-diagnosis of arthritis, 41.7% reported an AAAL. Within NHB individuals, among the 21.3% reported arthritis, 49.3% reported an AAAL (Barbour, et al., 2013) Findings suggest there is a disparity in disability outcomes between NHW and

NHB individuals with NHB individuals reporting a higher prevalence of arthritis-related activity limitations. However, it is important to note that the prevalence of arthritis-related activity limitations were high in both races. Identifying ways to reduce arthritis-related limitations and disability is key for improving outcomes in people with arthritis.

Education. Disparities in the prevalence of arthritis exist by education level as well. People with lower SES (income/education level) may have a higher prevalence of arthritis. NHIS data showed that among those who reported having a college degree or higher, 18.3% had doctor-diagnosed arthritis. In comparison, among individuals who reported less than a high school diploma, 25.7% reported having arthritis (Barbour et al., 2013). This shows that there is a negative association between SES and arthritis.

Body mass index. Obesity is a risk factor that is common for a multitude of diseases, including arthritis. Data from the NHIS survey found that the prevalence of arthritis was higher among individuals with a BMI $\geq 30 m/kg^2$ based on self-reported heights and weights. Among obese individuals, 31.2% reported that they had doctor-diagnosed arthritis (Barbour et al., 2013). Similarly, among overweight individuals (BMI $\geq 25 m/kg^2$ but $< 30 m/kg^2$) 22.6% reported they had doctor-diagnosed arthritis (Barbour et al., 2013). There is no definitive evidence showing obesity causes arthritis; however, risk factors of injury or repetitive stress on joints due to obesity may be a primary cause of arthritis. After examining a sample (N=1889) of individuals that had knee osteoarthritis or were at risk for knee osteoarthritis, Song and colleagues also reported that higher BMI $> 30 m/kg^2$ was associated with a higher prevalence of arthritis in NHB individuals (64.5%). Similarly, among NHW individuals, there was a higher prevalence (40.2%) in individuals who were overweight based on BMI.

Disability Caused by Arthritis

Arthritis is the leading cause of disability in adults, with around 19 million people in the US who report activity limitation due to the disease (Helmick et al., 2008). Nine percent of all Americans report a physical limitation due to arthritis (Cheng et al., 2010). Due to the growth of the aging population, arthritis-related mobility limitations are expected to rise. Original projections estimated 25 million people would have a mobility limitation related to arthritis by 2030 (Hootman et al., 2016). However, more recent projections estimate 35 million people with arthritis will have activity limitations by 2040 (Hootman et al., 2016; Barbour et al., 2014). NHIS data (2013) report disparities in disability between sociodemographic characteristics that include: age, gender, race, education level (Barbour et al., 2013).

Sociodemographic characteristics specific to disability. Older adults report higher disability rates compared to middle-aged adults. Among adults aged 65 and older with arthritis, 44.4% reported an arthritis-attributable activity limitation (AAAL; Barbour et al., 2013). Along with age, differences are seen by race (Barbour et al., 2013). More NHB (49.3%) individuals than NHW individuals (41.7%) report an AAAL (Barbour et al., 2013). Similarly, a larger percentage of females with arthritis (44.2%) report AAAL than men (41.9%) (Barbour et al., 2013). Functional disability is reported as a significant problem when examined with health-related quality of life. Individuals with arthritis report they are less likely to participate in social activities, go to the grocery store, or be physically active during disease flare ups (Trogdon, 2015). Nüesch and colleagues (2001) report that older adults with osteoarthritis have increased risk of mortality due to poor function, extreme walking disabilities, and other co-morbid risk factors. The aging

population is only growing, and disability rates are expected to rise as the baby-boomers get older, causing a serious societal concern.

Personal and Societal Cost

Overall arthritis cost. There is a substantial public health burden associated with arthritis due to its effects on physical disability, pain, and stiffness. The management of the disease through medical care places a tremendous burden on healthcare utilization and costs; these costs are projected to increase due to the aging population (Trogdon, 2015). Not only does the management and treatment encompass medical visits, ambulatory costs, hospital visits, and pain management costs; it also includes medications, surgical expenses and post-operation recovery costs. Individuals with arthritis interact with the healthcare system on a consistent basis for acute and chronic treatment. Helmick and colleagues (2008) report that 36.5 million ambulatory health care visits are made by individuals with arthritis: 84% of these visits are to a primary care provider, 6% are to an outpatient acute care facility, and 5% are to the emergency department. On average, there are about 744,000 yearly hospitalizations due to arthritis, and this number is greater for women (Helmick et al., 2008). Cisternas and colleagues (2009) reported a 100 billion dollar increase in the medical costs associated with arthritis in the US from 1997-2005. The total costs spent on doctor-diagnosed osteoarthritis in the United States between 2009-2011 was 70.5 billion dollars (Trogdon , 2015). One third of direct medical care costs encompass the medication that is necessary to manage symptoms, most of which is solely for pain management (Bitton, 2009). The burden of personal and societal cost increases as more risk factors (i.e. chronic diseases, aging, and obesity) are paired with arthritis (Bitton, 2009). This leads to expensive end of life costs

due to co-management of chronic diseases (Nüesch et al., 2011). The process of aging, the progression of arthritis, and higher disability rates have been shown to linearly increase the costs of arthritis treatment (Nüesch et al., 2011; Bitton, 2009). The more severe cases of arthritis lead to surgical management when pain management fails (Bitton, 2009). These can include, but are not limited to: knee replacement surgeries, hip replacements, or minimally invasive arthroscopies.

Joint surgery/procedure. Joint replacements substantially contribute to the high healthcare costs associated with arthritis. Joint replacements are commonplace within the older adult population, and the average age for a total knee replacement is 68 years old in the US (Bitton, 2009). A significant number of older adults experience total knee arthroplasty (TKA) or total hip replacements (THR) due to falls, repetitive stress to the joints, and/or severe osteoarthritis. Surgical intervention is becoming much more commonplace, but there is a high cost associated with it. Joint replacements for TKR and THR cost around $21,000 and $30,000 per surgery, respectively (Losina et al., 2009). This is not including post-surgical recovery in the hospital (Losina et al., 2009; Bitton, 2009). The combined cost of TKA and THR in 2007 was approximately $17.5 million dollars (Bitton, 2009). Without surgery, end-stage knee osteoarthritis costs are estimated to range from $2000-$10,500 per year for pain management treatment alone (Losina et al., 2009). Surgical intervention for severe cases of damaged joints has been shown to significantly increase quality of life and improve physical function in individuals with arthritis, but only if the cases are end-stage or the joints are severely damaged (Losina et al., 2009). These procedures have also been shown to be cost-effective in the cases of arthritis that are severe or end-stage joint disease (Losina et al., 2009; Bitton, 2009).

However, not all surgeries are successful the first operation, and a second surgery may be required. Second surgeries contribute to about 26.6% of total Medicare costs for TKR and THR surgeries (Losina et al., 2009). The costs of revision for TKR and THR start at $25,000 and $38,000, respectively (Losina et al., 2009). As the population ages, the number of joint replacement surgeries is expected to grow and cause an even greater societal burden (Bitton, 2009). Due to the high costs of these surgical interventions, it is important to find solutions to manage disease early before the disease progresses to end-stage. Although acute surgical intervention has shown to be cost-effective for increasing daily quality of life, the post-operational period can lead to consecutive missed days of work and being bed-ridden. Pain management is a chronic problem in individuals with arthritis and leads to absenteeism among people who struggle with severe pain and stiffness symptoms in the workplace. Outpatient medical care and acute medical treatment takes time, and this can lead to loss of productivity in the workplace.

Absenteeism. Arthritis impacts society through its effects in the workplace. Individuals with arthritis have greater rates of absenteeism, and the disease is associated with loss of productivity (Cisternas et al., 2009; Trogdon , 2015). The CDC cost calculator estimated economic cost of arthritis to be about $217 million US dollars, on average, per state for days of missed work due to disability or pain (Trogdon, 2015). The total cost also accounts for insurance contribution from Medicare and Medicaid coverage that represented 34% of the average cost per state (Trogdon, 2015). Productivity usually decreases with higher pain, and individuals with arthritis seek medical attention during work hours due to limited function and inability to focus (Cisternas et al., 20009). With

these high personal and societal costs, it is imperative to find other ways to manage the negative and debilitating symptoms of arthritis.

Quality of life. A combination of physical and emotional consequences due to arthritis affects an individual's overall quality of life. Fontaine (2011) states that health related quality of life, quality of life, and health status are common terms that can be used interchangeably. The individual's perception of overall health is used as a fairly accurate depiction of disease symptoms that affect the individual (Fontaine, 2011). The AIMS is an arthritis-specific measure of assessing quality of life. Other health-related quality of life surveys are administered to assess general components of health status. Components that make up health related QOL are physical function, pain, along with general health perceptions (Husted et al., 2001).

Quality of life in a study by Husted and colleagues (2001) examined physical function and pain, specifically. There was a scale of eight different dimensions that involved: dressing and grooming, arising, eating, walking, hygiene, reach, grip, and activities (Husted et al., 2001). The 36 item Short-Form (SF-36) was another scale that was used examined a multitude of different variables to assess overall quality of life was. Within individuals with arthritis compared to the general population without arthritis, individuals with a lower physical function and higher disability showed greater reductions in quality of life.

Self-perception of personal health status are indicators of how the progression of arthritis affects the individual. Arthritis is a gradually progressing disease, and monitoring quality of life perception can aid in understanding the severity of symptoms. Physical function and pain are highly related to quality of life, and these are the most

reported symptoms of arthritis (Fontaine, 2011; Shih et al., 2006; Wilcox et al., 2005). Finding ways to improve health related quality of life is important in improving self-efficacy and other psychosocial factors.

Exercise and Arthritis Management

Exercise is considered a cornerstone in the management of arthritis. Physical activity has been shown to improve arthritis-specific pain, improve physical function, reduce stiffness, and improve overall quality of life (mood/depression) (Song et al., 2013; Westby, 2013). Exercise has been recommended for managing not only arthritis-specific symptoms, but is also recommended for overall health (Westby, 2012). Arthritis-specific symptoms can lead to inactivity, which has been shown to increase risk factors for other co-morbidities like heart disease, obesity, and Type II diabetes (Westby, 2013).

Benefits of aerobic, anaerobic, and flexibility. Current recommendations from ACSM and the AHA for physical activity in individuals arthritis recommend engagement in at least 30 minutes of low-impact, moderate intensity aerobic activity (aquatic exercise, bicycling) at least three times per week, resistance training targeting major muscle groups of the body with moderate weight on two days a week , and flexibility and stretching exercises at least twice a week (Nelson et al., 2007) While the general population is recommended to partake in vigorous intensity aerobic exercise and increasing weight (pounds) for anaerobic training, it is contraindicated for people with arthritis to partake in vigorous exercise because it may exacerbate existing symptoms (Westby, 2009). The ACSM also reports that vigorous intensity and higher resistance against the joints is contraindicative for people with arthritis, specifically during

inflammatory flare ups. (American College of Sports Medicine& Pescatello, 2014; Centers for Disease Control and Prevention, 2015)

Suomi and Collier (2003) looked at two different styles of recommended arthritis-specific programs that were recommended by the National Arthritis Foundation (NAF) and the American Geriatric Society (AGS) among older adults aged 60-79 years old with doctor-diagnosed arthritis. They compared land-based exercise intervention versus aquatic based exercise looking on several outcomes including agility, cardiorespiratory fitness, balance, and strength to measure what outcomes each program had on pain (Suomi & Collier, 2003). They found that either group performing at moderate intensity at least twice a week gained benefits and ameliorated the symptoms of pain compared to the control group ($F_{1,27}$=6.0, p<.05) (Suomi & Collier, 2003).

Ettinger and colleagues (1997) performed an exercise intervention based on the Fitness Arthritis and Senior Trial (FAST) trial to explore what effects exercise had on disability within individuals with knee osteoarthritis. With an initial sample of N=365, Ettinger and colleagues (1997) had three groups (aerobic, resistance training, and health education) and compared the two exercise groups to the control (health education) group. The participants were randomly assigned to one of the three groups for an 18-month program. The aerobic group was initially a 3-month facility-based program under direct supervision, and then the remaining 15-months were based at home with maintenance phone-calls. Participants performed aerobic exercise for 1 hour, three times a week, at a heart rate reserve ranging between 50-70% (assessed through a graded VO_2 treadmill max test). The resistance training group was also a 3-month facility-based program under direct supervision, and the remaining 15-months were based at home with maintenance

phone calls. The participants were required to do a total of 9 full body exercises (2 sets of 12, three times a week). The health education control group was shown videotapes that were one and a half hour sessions including information on arthritis from the Arthritis Foundation under direct supervision of a nurse. Primary and secondary outcomes of the study were compared to the control group. The exercise groups compared to the control group had less self-reported disabilities within the aerobic ($p<0.001$) and resistance groups ($p=0.003$). The FAST trial was associated with higher positive outcome measures for individuals with doctor-diagnosed arthritis, showing that over an eighteen-month exercise intervention there could be exercise specific benefits from either aerobic or anaerobic training.

The American College of Sports Medicine recommends a general guideline to the US adult population for aerobic, anaerobic, and flexibility training (American College of Sports Medicine & Pescatello, 2014). These recommendations have been proven to yield health benefits for reducing overall mortality. The aerobic recommendations are three to five days a week of low-to-moderate intensity exercise or at least 3 days of vigorous intensity exercise a week (American College of Sports Medicine & Pescatello, 2014). Strength recommendations are to perform total body lifting at least twice a week, and flexibility and stretching at least 2 days per week (American College of Sports Medicine & Pescatello, 2014). These recommendations are safe for the arthritis population, but it has been suggested to follow the lower-intensity recommendations versus this vigorous or higher intensities. The ACSM guidelines are recommended for maximum health benefits (Nelson et al., 2007). Although the exercise benefits are known, exercise participation in individuals with arthritis is lower compared to the general population.

Exercise participation in individuals with arthritis. Despite the numerous, well-known benefits of exercise for people with arthritis, people with arthritis are less likely to meet current recommendations for physical activity. Previous studies using self-reported PA data indicated people with arthritis are less likely to meet PA recommendations. Of the 48.3% people in the US that are meeting the ACSM recommendations for physical activity in the US today, based on NHIS data, 17.4% of people have arthritis (Barbour et al., 2013). Of the 51.6% of people in the US that are not meeting the ACSM recommendations, 54.2% of them report having arthritis (Barbour et al., 2013). Similarly, according to Fontaine and colleagues, 60% of people with doctor-diagnosed arthritis are not meeting the ACSM physical activity recommendations for the general population. (Fontaine et al., 2004). These statistics show the alarming proportion of individuals with arthritis who do not meet the physical activity recommendations. Understanding the factors that influence exercise participation is critical for designing interventions and promoting physical activity in people with arthritis. Numerous factors influence physical activity participation in people with arthritis and it is pivotal to understand the correlates of physical activity to design better physical activity interventions for individuals with arthritis.

Correlates of Physical Activity

Sociodemographic characteristics.

Age. **:** Similar to the general population, many sociodemographic characteristics including: race, age, gender, income/education level, and BMI affect exercise participation (Shih et al., 2006; Der Ananian et al., 2015; Song et al., 2013; Wilcox et al., 2005). Physical activity declines with age in the general population and among

individuals with arthritis. Based on national BRFSS data, Kruger and colleagues (2005) reported older adults over the age of 50 had10% higher rates of inactivity compared to 18-44 year olds in 2004. From 1994 to 2004, physical inactivity declined from 29.8% to 23.7% ($p<.001$), but adults above 50 years of age still had the highest rates of inactivity. The largest decline in physical inactivity was within women aged 60-69 years old (37.8% to 28.5%) and in males 50-59 years old (33.5% to 23.5%) (Kruger et al., 2005). These same trends have been reported among individuals with arthritis. Physical activity participation decreases with age, especially after the age of sixty five (Song et al., 2014; Shih et al., 2006., Peek & Coward, 1999). Shih and colleagues (2002) collected data from the 2004-2005 NHIS data that was focusing on recommendations for physical activity from Healthy People 2010 and one arthritis-specific physical activity recommendation. Of the older adults that reported having doctor-diagnosed arthritis, 54.9% of men and 49.8% of women did not meet the recommendations, and it was statistically significant compared to 18-44 age group ($p<0.05$) (Shih et al., 2006) Adults between the ages of 45-64 were compared to ages 18-44 group. About 40% of men and 38.6% of women did not meet the recommendations ($p<0.05$) (Shih et al., 2006). Through these associations it is apparent aging is associated with decreased physical activity levels.

Gender. It is important to explore gender differences within individuals with arthritis because females are diagnosed with arthritis at higher rates than men. Males with arthritis are more likely to meet the general physical activity recommendations than females (Nelson et al., 2007; Song et al., 2013; Der Ananian et al., 2015; Hootman et al., 2016). Dunlop and colleagues (2011) performed a study that objectively measured physical activity level through accelerometers. They reported notable differences in

physical activity levels by sex within individuals with osteoarthritis. Aerobic physical activity recommendations were met by a higher percentage of men (12.9%) than women (7.7%), and more women (56.5%) than men (40.1%) did not meet the physical activity recommendations (Dunlop et al., 2011). They also found that men were more likely to partake in moderate-vigorous intensity exercise (56.5%, $p<.001$) compared to their female counterparts, and men spent more time in low-intensity exercise (Dunlop et al., 2011). Objective accelerometer data showed men were more likely to meet physical activity guidelines (22%) than women (10.8%) (Dunlop et al., 2011). Shih and colleagues (2006) analyzed BRFSS data and noted that among people with and without doctor-diagnosed arthritis, men had lower prevalence rates of physical inactivity than females. They found that 57.9% of women showed levels of inactivity compared to 49.8% of men.

Race. Racial disparities exist when examining patterns of physical activity. Song and colleagues (2013) examined the proportion of NHB and NHW individuals with or at risk for knee OA who were meeting physical activity recommendations using accelerometry. Findings from this study, suggested NHB individuals were 90% less-likely to meet the physical activity guidelines compared to NHW individuals (Song, Hochberg, Chang, Hootman, Manheim, Lee…, 2013). After controlling for other factors known to be associated with physical activity participation (i.e. income level, education level, depressive symptoms, overweight/obesity, and knee pain), African-Americans were still 76% less likely to meet the physical activity recommendations (Song et al., 2013). Trends show Non-Hispanic White individuals are more likely to meet physical activity recommendations than Hispanics and Non-Hispanic Black individuals is common within the arthritis population (Der Ananian et al., 2015). Shih and colleagues

reported from the NHIS (2002) data that NHB individuals with arthritis were 1.5 times more likely to be physically inactive compared to NHW (OR=1.5, CI= 1.2-1.8, p <0.05). They also reported that Hispanics with arthritis were 1.3 times more likely to be physically inactive compared to NHW individuals (OR=1.3, CI=1.1-1.7) (Shih et al., 2006). There is clearly an association with NHB individual being less physically active then NHW individuals, and there needs to be more understanding why.

Socioeconomic status. Individuals with lower socioeconomic status have been shown to have decreased physical activity participation (Nelson et al,. 2007; Helmick et al., 2016; Hootman et al., 2016; Hootman et al., 2003; Shih et al., 2006). Using data from the 2002 NHIS survey, Shih and colleagues (2006) found women with doctor-diagnosed arthritis who had less than a high school education were 1.9 times more likely to be physically inactive than people with a college degree or higher (OR=1.9, CI=1.5-2.4) . Likewise, men with doctor-diagnosed arthritis who had less than a high school education were 1.7 times more likely to be physically inactive than people with a college degree or higher (OR=1.7, 1.5-20) (Shih et al., 2006). Lower educational levels are associated with higher prevalence of physical inactivity. Parks and colleagues (2003) did a cross-sectional study phone survey (Modified BRFSS) assessing if rural, suburban, or urban residents were more likely to meet the physical activity recommendations. They reported that people with lower income (<$10,000) in rural areas were less likely to participate in exercise or meet physical activity recommendations (OR=.45, CI=0.2-0.97) (Parks et al., 2003). One interesting thing to note is although people in urban areas were in the lower income category (<$10000), they were 1.05 times more likely to meet the recommendations than people with same income in rural areas; however they both did

not meet the physical activity recommendations (OR=1.05, CI= 0.6-1.82) (Parks et al., 2003). Fontaine and colleagues (2004) also performed a BRFSS telephone-survey in 2001, and found people with arthritis who had less than 8 years of formal education reported a higher prevalence of physical inactivity (47.6%).

Physiological States.

***Body mass index*.** Not only is a high BMI ($30m^2$/kg) an independent risk factor for arthritis, it is a risk factor for physical inactivity. A recent study reported that 43.7% of individuals with arthritis (collected from BRFSS) are obese >30m/kg2 (Schoffman et al., 2013). Shih and colleagues (2006) reported that 45.9% (OR=1.1, CI=0.9-1.3) of men and women with a BMI >$30m^2$/kg with arthritis have higher rates of inactivity.

***Physical function*.** Higher disability and physical function limitations are associated with lower physical activity rates. Shih and colleagues (2006) found that there was a higher prevalence of physical inactivity within adults that have four or more functional limitations ($p<.05$). Men with 4 or more functional limitations are 3.3 times more likely to not meet physical activity recommendations compared to their counterparts with zero functional limitations(OR=3.3, CI=2.6-4.2, $p<0.05$). Men with 1-3 functional limitations are 1.3 times more likely to not meet physical activity recommendations (OR=1.3, CI=1.2-1.6, $p<0.05$). Compared to women with no functional limitation, women with 4 or more functional limitations were 4.8 times less likely to meet physical activity levels (OR=4.8, CI=3.1-7.5, $p<0.05$) and women with 1-3 functional limitations were 1.6 times less likely to meet physical activity recommendations (OR=1.3, CI=1.2-2.1, $p<0.05$) (Shih et al., 2006). Lower physical function levels is also associated with a higher BMI (> 30 kg/m2), and the majority of the arthritis population is

overweight or obese. This shows a negative association between physical function and physical activity levels.

Pain. Pain is the most common symptom of arthritis. The debilitating nature of the disease causes pain, stiffness, and limited mobility secondary to pain. Although exercise is the recommended management of arthritis pain, people with arthritis fear exacerbation of symptoms from exercise. Exercise has been shown to ameliorate the symptoms of pain (Suomi and Collier, 2003). Suomi and Collier (2003) found that participation in 2 bouts of moderate-intensity exercise in a land-based or aquatic based program can improve perceived pain and actual pain. Out of a sample of 30 (N=30), a physical activity intervention that was administered for 8 weeks compared to the no exercise control showed improvements in activities of daily living (ADL) (Suomi and Collier, 2003). They were two measures: difficulty performing the task or pain associated with the task. The pain ADL measure improved in the exercise groups compared to the control (F=13.21, p<0.05). There was also a significant change in pain reporting scores in the aquatic based class initially reported as 51±14.9 to a post-intervention score of 44.5±13.1 (Suomi and Collier, 2003).

Exercise can manage pain, but people with regular and higher physical activity levels report the ability to manage the symptoms of arthritis (Der Ananian et al., 2006). However, people who do not exercise regular and have lower physical activity describe constant pain throughout the exercise regimen (Der Ananian et al., 2006). Wilcox and colleagues (2007) did a qualitative analysis of a group of older adults, exercisers vs non-exercisers, with arthritis. They looked at the perceived barriers to exercise. There were three different ways pain was described: before, during, or after exercise. Individuals who

exercised regularly were more likely to make changes to their workouts whereas people who did not exercise regularly would simply quit exercise (Wilcox et al., 2007). Focht and colleagues (2006) have analyzed short-term and long-term interventions that highlight that pain plays a significant role on exercise participation. Due to pain, Focht and colleagues (2006) reported higher attrition rates after exercise. Shih and colleagues (2006) also reported that individuals with arthritis that have had severe (7-10) pain in the last 30 days report being less likely to meet physical activity levels ($p<0.05$). Men are 1.3 times less likely (OR=1.3, CI=1.1-1.6), $p<0.05$) and women are 1.5 times less likely (OR=1.5, CI=1.2-1.8) to participate in physical activity with severe (7-10) pain symptoms. This makes up 57.5% of the people who reported arthritis in NHIS 2002 (Shih et al., 2006). However, people reporting less than a score of 6 out of 10 pain in the prior thirty days did not have a significant change between little to none (0-3) to moderate (4-6) pain for levels of physical activity levels. There is a negative association between high levels of pain and low physical activity levels.

Emotional States.

Depression. Although physical states encompass a large part of the debilitating nature of arthritis, mental health is another concern that contributes to physical inactivity. Mental health concerns, including anxiety and depression, are highly prevalent in people with arthritis. Shih and colleagues (2006) reported more than half (54.1%) of people with arthritis who reported anxiety/depression were physically inactive compared to the 39.7% of individuals with arthritis that did not report anxiety/depression. Previous studies have indicated that individuals who have markedly high depressive symptoms when tested at

baseline will benefit significantly from exercise interventions or overall increases in physical activity (Penninx, Rejeski, Pandya, Miller, Di Bari, Applegate & Pahor, 2002).

Psychosocial Characteristics.

Self-efficacy. Self-efficacy is defined by Bandura as one's belief in one's ability to successfully perform a task (Bandura, 1997). Self-efficacy is the strongest predictor for physical activity participation (Ashford et al., 2010; Wilcox et al., 2005). This is generalizable across healthy and diseased populations. Within the arthritis population, exercise adherence is a major problem in the management of disease symptoms. Increasing self-efficacy is important for increasing physical activity level. Self-efficacy is involved at every stage within exercise programs. In previous literature, SE used to be specific for beginning an exercise program; however, McAuley and colleagues (2000) report that SE is situation-specific and is important to evaluate when changing a behavior over time. Self-efficacy has been seen to have positive associations with physical activity level and arthritis (Der Ananian et al., 2008). In a sample of N=141 community-dwelling individuals with arthritis, regular exercisers reported greater self-efficacy ($p<0.05$) and were 10% (OR=1.14, CI=1.08-1.20) more likely to meet arthritis-specific recommendations (Der Ananian et al., 2008).

Self-efficacy has been shown to be a predictor of exercise adherence within arthritis and among the general population as well. Correlates that have been explained above have different associations with self-efficacy. Low self-efficacy for physical activity is correlated with female sex, black race, low education/income level, overweight BMI ($\geq$25m/kg^2), and low physical activity levels. Specific to arthritis, high amounts of pain, high perceived/anticipated pain, and decreased physical function have shown

negative associations with SEE and participation in exercise (Wilcox et al., 2008). Many trends that are seen with exercise participation are similar to what increases self-efficacy for exercise. Other psychosocial factors that play a role in influencing self-efficacy are social support and outcome expectations. It is important to evaluate correlates that predict or affect self-efficacy, because it is the strongest predictor of exercise.

Past performance attainment. Prior physical activity levels are measured to evaluate past physical behaviors of exercise. Bandura states that an individual will have higher self-efficacy when doing a behavior they have successfully completed before (Bandura, 1977). The relationship of prior physical activity or current physical activity levels may be associated with higher physical activity levels. Performance attainment is pinpointed to past behaviors contributing to the current goal or task. Individuals with lower past physical activity levels and limited resources display lower rates for physical activity participation (Song et al., 2016; Wilcox et al., 2005). It is important to evaluate the levels of physical activity to understand where an individual's baseline is. Among individuals with arthritis, severe progression of arthritis yields lower rates of physical activity participation (Hootman et al., 2016). The CDC recommendation is to begin exercise at an early stage of arthritis to delay the progression of the disease, and past physical activity contributes to confidence in exercising with arthritis (Centers for Disease Control and Prevention, 2015). Past physical activity levels are usually measured through self-report measures and whether individuals are meeting physical activity recommendations in a short, recent, period of time. The associations show that people with higher amounts of self-report exercise (total physical activity minutes) may have a higher self-efficacy. For physical activity with arthritis, Der Ananian and colleagues

(2006) reported that people who had exercised in the past could manage arthritis symptoms better than individuals starting new exercise programs. People who exercised prior to having arthritis report utilizing a wider variety of exercises compared to people who did not exercise prior that only report walking (Der Ananian et al., 2006). This topic could be further explored by learning how long an individual needs to be consistently involved among physical activity to form a habit.

Social support. Social support has not been shown to predict higher physical activity participation, but within individuals with low self-efficacy there may be benefit to increasing social support. Taal and colleagues (1993) report that adherence with health recommendations, physical activity and quality of life recommendations, is an issue for individuals with arthritis, but social support can be a motivating factor to improve self-efficacy for exercise and efficacy to cope with arthritis. Frase and Spink (2001) analyzed a sample of 49 female participants to assess specific correlates that aid in exercise compliance. This population was not specific to arthritis (n=6), but the sample characteristics displayed individuals with co-morbidities. Since there is limited research with social support, the trends seen here may be applicable to the arthritis population and exercise participation. The role of social support and support in a setting of a group(cohesion) was tested through attendance (compliance behavior) to an exercise class. Women who scored higher on the social support scores attended more classes ($\chi 2(3) = 13.65$, $p = .003$) than the dropouts who had lower attendance with lower perception of cohesion and lower group orientation scores. Social support should be examined as a motivating factor with BSE and SEE.

Outcome expectations. Mielenz and colleagues (2013) explored the roles for outcome expectations and self-efficacy of arthritis management in relation to physical activity. Mielenz and colleagues (2013) looked separately at self-efficacy for physical activity and found that there was a relationship between self-efficacy and physical activity ($p<0.05$); however, there was not a relationship between physical activity and outcome expectations or self-efficacy for arthritis management. This study was a randomized control study of individuals (N=171) who participated in supervised People with Arthritis Can Exercise (PACE) classes (strength, balance, increase range of motion, and endurance exercises) twice a week for eight weeks. The Self-efficacy for physical activity (SEPA) scale was used to assess confidence in one's ability to be physically active in the presence of barriers, and EOE was measuring outcome expectations for exercise. Although outcome expectations for exercise was not significantly associated with self-efficacy for physical activity, more than half of the participants (59%) reported high outcome expectations for exercise raw scores (4.1, range = 1–5) (Mielenz et al., 2013). Ferrier and colleagues (2010) examined self-efficacy and outcome expectations and the associations on physical activity among individuals with multiple sclerosis. Self-efficacy made up 29% ($R^2=0.29$) of the variance for physical activity model and had about an 8% ($R^2=0.078$) contribution to the variance of outcome expectations (Ferrier et al., 2010). This shows that self-efficacy is a predictor for outcome expectations with exercise, and needs to be studied more in depth during an exercise intervention.

Conclusion

Arthritis is highly prevalent in the United States with the prevalence projected to increase due to the aging population. Arthritis affects predominantly women, NHB and

NHW individuals, and disproportionately affects adults over the age of 65. It is associated with higher BMI (>25m/kg2) and other co-morbidities. Arthritis is a leading cause of disability in the United States and is also projected to increase with the aging population. Arthritis is also costly from a personal and societal level and growing exponentially. Arthritis is irreversible and there is no cure, and this causes exorbitantly high financial burden for management of arthritis. Ambulatory visits, hospitalizations, surgical intervention, and pain management make up a large cost of the disease. Individuals with arthritis suffer from a multitude of physical and emotional consequences. Pain, stiffness, and physical function are the most commonly reported symptoms that individuals with arthritis suffer with. Depression is highly prevalent among individuals with arthritis but no causal relationship has been determined. These consequences inhibit overall quality of life and overall health status. Exercise is recommended for improving symptoms of arthritis, yet people with arthritis are less likely to engage in physical activity. Sociodemographic characteristics affect physical activity participation. Individuals with arthritis who are older than the age of 65, females, NHB individuals, and lower educational level are associated with lower exercise participation. Higher BMI, lower physical function, and higher pain levels are associated with lower physical activity levels. Higher depression levels are also associated with lower physical activity levels. Self-efficacy is one of the most consistent psychosocial correlates and determinants of exercise in people with arthritis. Other psychosocial correlates that need to be further examined are social support and outcome expectations for exercise. These are positively associated with SE, but need to be studied further.

CHAPTER 3

METHODS

This study was a secondary data analysis of cross-sectional data originally collected between 2006-2008 in Chicago, IL as part of a project funded by the Midwest Roybal Center for Health Promotion at the University of Illinois at Chicago (Der Ananian et al., 2015). The objectives of the original funded study were to (1) qualitatively examine perceived facilitators and barriers of physical activity in African-Americans with arthritis and (2) to examine the potential correlates of physical activity in African-Americans and Caucasians with arthritis. The same data collected to address the second objective was used in the present study.

Subjects

Study participants were community-dwelling, older adults with arthritis (n=205) who were willing to complete a survey about their physical activity and potential health, psychosocial and environmental influences on physical activity. Inclusion criteria for this study included: at least 50 years of age, able to provide a self-report of a healthcare provider's diagnosis of osteoarthritis; self-identify as non-Hispanic Black or non-Hispanic white; and able to read, write and speak English. Participants who were under the age of 50, lacked a healthcare provider's diagnosis of arthritis, who could not read, write or speak English, who could not provide consent to participate or who did not self-report their ethnicity as non- Hispanic White or non-Hispanic Black were excluded. Efforts were made to recruit a sample that was 50% non-Hispanic Black and 50% non-Hispanic white.

Recruitment

Recruitment for the study took place in the greater Chicago area. Flyers were placed in several Chicago Department on Aging Senior Centers and in three different Mather's Cafes in the Chicago area. Face- to- face recruitment occurred in the senior centers and the Mather's Cafes during events (health fairs, Coffee and Caucus, parties such). Research team members attended these events and either gave presentations about the research study or manned a table with information about the study. Letters describing the study were sent to members of the Greater Chicago Area Arthritis Foundation by the Arthritis Foundation on two occasions. Additionally, an announcement was posted on the Greater Chicago Area Arthritis Foundation website and the study was advertised in their newsletter. To enhance participation of African-Americans, an advertisement was placed in the Citizen; which is a newspaper that has a target audience of predominantly African-Americans. Two local senior housing complexes located on the south side of Chicago provided flyers to every resident of the complex. Flyers were also placed in community-based establishments including churches, restaurants, fitness centers, community-bulletin boards, and park facilities. Finally, flyers were placed in the "goody bags" for the 2007 SHAPE (Senior Health Alliance Promoting Exercise) walk, which had an attendance of 1,550 individuals. All recruitment information used can be found in Appendix I.

Human Subjects

Original Institutional Review Board (IRB) (Appendix I) approval was obtained on September 27th 2006 from the University of Illinois at Chicago. IRB approval for the

secondary data analysis was obtained from Arizona State University. All subjects were provided informed consent (Appendix I) prior to participation in the study.

Study Design

This study used a cross-sectional design to examine the potential correlates of barriers self-efficacy and exercise self-efficacy. The present study used the self-efficacy theory as the theoretical framework underlying the research questions. The original study used the Social Ecological Model as the theoretical foundation to identify the complex influences on physical activity participation in people with arthritis. Specifically, participants were asked to complete questionnaires regarding socio-demographic characteristics (age, gender, BMI, income, education level, race, marital status, employment status, and physical activity levels), health and arthritis specific variables (e.g., pain, physical function, etc), physical activity level, psychosocial factors (e.g., self-efficacy, social support for exercise, outcome expectations), and social-environmental factors (e.g., neighborhood cohesion, neighborhood safety, and access to arthritis-specific programs) related to physical activity. All eligible participants were sent the questionnaire via mail and asked to return it via mail. Participants were provided a $25 honorarium for completion of the surveys.

Dependent Variables (DV)

This study had two similar yet subtly different dependent variables: exercise self-efficacy(SEE) and barriers self-efficacy(BSE). Self-efficacy for exercise is defined as one's confidence in one's ability to perform exercise. Barriers self-efficacy, focuses on situational self-efficacy. Specifically, it evaluates individuals' confidence in their ability to successfully engage in exercise when barriers to exercise are present or perceived (e.g.,

I am confident I can exercise when I don't have time or I am confident I can exercise when the weather is bad). Although these two concepts are similar they are conceptually different, and it is plausible different factors will influence them.

Independent Variables (IV)

The independent variables included demographics (age, race, sex, and education level as a marker of SES), adverse physical states (perceived physical function, overweight/obesity, pain), psychological arousal (negative affect), social support, performance outcome expectations and physical activity level. For race, the study sample only includes NHB and NHW individuals, consistent with the intent of the original research study. (Song et al, 2013). Education level was used as a proxy for SES due to unanswered questions regarding income. Although income level was included on the demographic portion of the survey, approximately 30% of the sample refused to answer this question. Perceived physical function, pain and negative affect was obtained from responses on the Arthritis Impact Measurement scale (Version 2; (Meenan, Mason, Anderson, Guccione, Kazis, 1992). BMI was determined from self-reported height and weight. Physical activity levels were defined based on responses to a modified version of the 2001 PA module from the Behavioral Risk Factor Surveillance System (BRFSS). Participants were classified as meeting the American College of Sports Medicine recommendations for aerobic PA levels (American College of Sports Medicine & Pescatello, 2014).

Theoretical Framework

This study used the Self-Efficacy (SE) Theory, as the underlying framework to explore potential correlates of SEE and BSE. According to Bandura, SE is defined as the intrinsic belief that one is able to complete a task successfully (Bandura, 1977; Bandura, 1997). It is important for health behaviors because it is one of the strongest predictors for achieving higher physical activity levels in the osteoarthritis population (Bandura, 1977, Song et al., 2013). According to the SE theory, a person's confidence in their ability to perform an activity is behavior and situation specific and it is derived through multiple pathways: performance attainment, social support, physical states, emotional states, and vicarious learning (Bandura, 1977). Physical states are measurable anatomical or a physiologic representation of the body. Emotional states are the psychological components involving mental health. Verbal Persuasion is described as a form of support from others, not yourself. Performance Attainment is successful performance of the behavior in the past. Vicarious learning is the art of observational learning by watching other people perform a task, and from this experience being able to learn how to do that task. In the present study we operationalized the pathways leading to development of SE as follows: Physical states is described as the pain that participants feel with arthritis, perceived physical function, and obesity. Emotional states relate to psychological levels that encompass negative affect. Verbal Persuasion will be defined as social support for physical activity. Performance Attainment will be the current physical activity levels of the participants. **Figure 1** provides an illustration of how we will use SE theory to examine the potential correlates of BSE and SEE in older adults with arthritis.

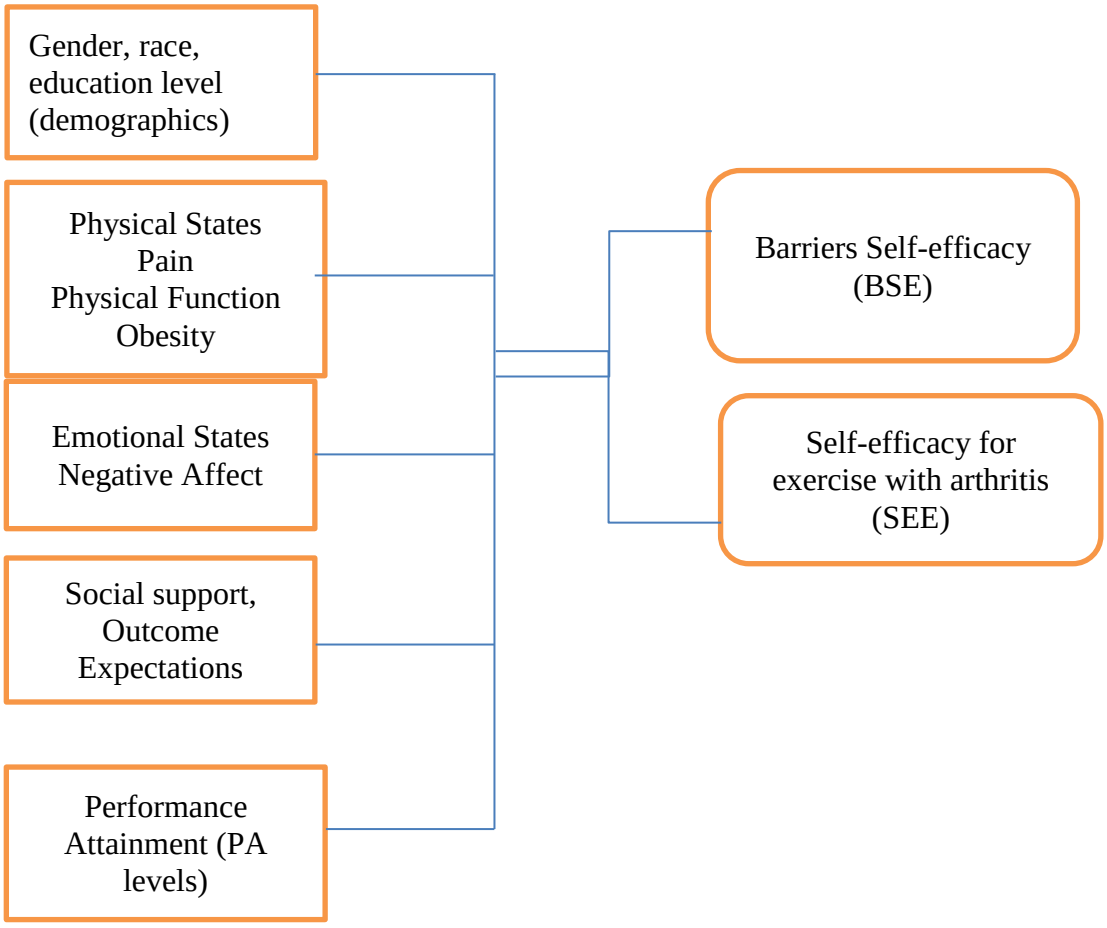

Figure 1. Illustration of Independent Variables Leading to Dependent Variables

Dependent Variables

Exercise self-efficacy. Self-efficacy for exercise (SEE) was assessed using the 3-item Lorig self-efficacy for exercise scale (Lorig et al., 1989). Participants were asked to rank their confidence in their ability to engage in regular exercise. More specifically, the Lorig scale assesses participants' confidence to engage in strength and flexibility exercise, aerobic exercises and to exercise without making their arthritis symptoms worse. Participants indicated their level of certainty using a 10-point Likert scale (not confident at all = 1 to totally confident =10). The average total score for the three

questions was calculated. In a study with 478 individuals, the Lorig self-efficacy for exercise scale had good test-retest reliability (0.86) and the Cronbach's alpha for internal consistency was 0.83. The Lorig self-efficacy for exercise was created for multiple chronic diseases, not specifically for arthritis and neither were the previous validation studies

Barriers Self-Efficacy. BSE was assessed using a five-item scales assessing one's confidence in their ability to exercise in the presence of barriers. For each question, participants ranked their confidence using a 7-point Likert Scale (not confident = 1 to very confident = 7). The average total score for the five questions was calculated (Marcus, Selby, Niaura, Rossi, 1992). The survey has been shown to have good test-retest reliability (0.90) with an internal consistency coefficient (ICC) of 0.76 (Marcus et al., 1992). In a follow-up study, the internal consistency of the survey was 0.84 (Marcus et al., 1992). The validity and reliability of this scale has not been measured specifically in individuals with arthritis.

Independent Variables

Sociodemographic Characteristics. All participants were asked to complete information about their demographic characteristics including age (50 and older), sex (male or female), race (Non-Hispanic White or Non-Hispanic Black), education level (no high school degree, high school degree or GED obtained, associate's degree, bachelor's degree, master's degree, or doctoral agree or above), type of arthritis (rheumatoid arthritis, osteoarthritis, etc.), and presence of other comorbidities (yes/no).

Physical function, Pain, Negative Affect. Perceived pain, physical function impairment and negative affect were assessed with the Arthritis Impact Measurement

Survey (AIMS 2). The AIMS2 (Appendix B) is a 78-item questionnaire assessing the impact of arthritis on several domains including physical functioning, pain, psychological status, social interactions, social support, perceptions of health (Gignac, Cao, Mcalpine, & Badley, 2011).This study used a shortened, three component model (physical function, affect and symptoms or pain) to assess arthritis impact. Physical function was determined by calculating a summary score for six subscales: level of mobility, walking and bending, hand and finger function, arm function, personal care, and household tasks. Affect was determined by calculating a summary score for two subscales: tension and mood. A higher normalized score is indicative of poorer outcomes (score of 0= good and 10= poor). Symptom included one scale and it evaluates a person's overall pain associated with arthritis. Each subscale from the AIMS survey was normalized to a 0-10 scale prior to calculating summary scores. A higher normalized score is indicative of poorer outcomes (score of 0= good and 10= poor). The normalized scores are necessary to enhance the consistency of scoring across the subscales; each subscale does not have the same possible total score. Normalizing the scales to a 0-10 scoring system allows for comparable interpretations of the scales.

The AIMS2 has been shown to be a reliable and valid scale for assessing the overall impact of arthritis-specific symptoms. In the original validation study, the Cronbach's α coefficients for each scale ranged from 0.72 to 0.91 in a group of individuals with rheumatoid arthritis (n = 299) and from 0.74 to 0.96 for each scale in a group of individuals with osteoarthritis (Meenan et al., 1992). In a three-week period, test-retest reliability showed an ICC value for each subscale that ranged from 0.78 to 0.94 (Meenan et al., 1992).

Physical Activity. A modified version of the Physical Activity module from the 2001 Behavioral Risk Factor Surveillance System survey was used to assess physical activity levels. The BRFSS is the most well-known telephone survey used to evaluate population physical activity levels in order to predict and estimate the prevalence of comorbidities of the population (CDC , 2001 Behavioral Risk Factor Surveillance System). The 2001 version of the BRFSS PA module asked questions related to physical activity, including occupational activity, exercise intensity, and time spent engaging in physical activity/exercise (CDC , 2001) Behavioral Risk Factor Surveillance System). The wording of the 2001 BRFSS PA module was slightly modified for this study to help explain purposeful exercise. Specifically, the 2001 BRFSS physical activity module was used to evaluate moderate and vigorous levels of purposeful exercise, gardening, vacuuming, and yard work were omitted from the wording of the question (Der Ananian et al., 2015}. Based on responses to the survey, participants were classified as either meeting the PA guidelines or not meeting PA guidelines (American College of Sports Medicine & Pescatello, 2014). Individuals who reported participating in moderate physical activity for a minimum of 30 minutes on five or more days per week or who reported engaging in at least 20 minutes of vigorous intensity physical activity for a minimum of three days per week were classified as meeting the recommendations for physical activity.

BMI. BMI (m/kg^2) was calculated using self-reported height and weight. Participants were classified as underweight if they had a BMI < 18.5 kg/m^2, normal weight if they had a BMI between 18.5 and 24.9 kg/m^2, overweight if they had a BMI between 25.0 and 29.9 kg/m^2, and obese if they had a BMI $\geq$ 30.0 kg/m^2.

Social support. Social support was assessed using a 5- item Likert scale with a score ranging from 0-5 (Eyler, Brownson, Donatelle, King, Brown, Sallis, 1999). Participants rated their level of agreement regarding the support they receive from their family and friends to be physically active using a five-point Likert scale (Strongly Disagree = 1 to Strongly Agree = 5). Examples of questions include: if I had someone like a friend or family member to be physically active with, chances are that I would be more physically active, my friends encourage me to be physically active and I have at least one relative who would commit to engaging in physical activity with me.

The reliability and validity were assessed and measured in a study done by Eyler and colleagues (1999). They validated their measure, Cohen's Kappa(k), by using a study done to derive a constant. The k was split into four categories and the physical activity social support ranged from .36-.55. The Chronbach's α reliability measure was 0.70; which is considered valid for representing moderate internal consistency with the whole measure scale (Eyler et al., 1999).

Outcome Expectations. Outcome expectations for exercise were assessed with a 9- item questionnaire (refer to Appendix C). Participants rated their perceptions about what benefits they would obtain from exercise using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Examples of questions include: exercise makes me feel better physically, exercise makes my mood better in general, and exercise helps me fell less tired (refer to Appendix C). Steinhardt and Dishman's 9-item scale was the original study evaluating the validity and reliability of the measures for outcome expectations for exercise (Steinhardt & Dishman, 1989). Outcome expectations have a strong association with predicting participation in exercise (Steinhardt & Dishman, 1989;

Resnick & Jenkins, 2000). Steinhardt and Dishman (2000) analyzed two studies that found internal consistency ranged from 0.47 to 0.78 with test-retest correlations of .66 to .89; the second study had an internal consistency that ranged from .66 to .85. Resnick and colleagues (2000) derived this measure to assess outcome expectations in older adults. Resnick and colleagues (2000) found α internal consistency of .78 with correlation of 0.89 ($p<0.05$) signifying validity. An association between self-efficacy and outcome expectations was found as $r=0.66$ (Resnick, & Jenkins, 2000). Murrock and Faye (2014) measured reliability and validity of the 9-item scale among African American Women and found the Cronbach's α 0.70 deeming it reliable. They also found construct validity from the outcome expectations in the itemized questions, and SEE was correlated with outcome expectations ($r=0.41$, $p<0.001$) (Murrock & Faye, 2014).

Data cleaning

The data was obtained through surveys that were self-report. The initial sample was obtained from NHW and NHB individuals in the greater-Chicago area that had a self-report diagnosis of osteoarthritis. The initial sample had 208 people that returned the surveys through mail that were complete or semi-complete. A total of 41 surveys were excluded from the present data analysis due to missing data on either the dependent variable (7), or at least one of the independent variables (n=34).

Statistical Analyses

All data were examined for normality using the Kolmogorov-Smirnov test in SPSS and an evaluation of the skewness and kurtosis of the data. Any variable that had a skewness or kurtosis greater than 1 was considered non-normally distributed. Non-normally distributed variables (physical function and BMI) were transformed and/or non-

parametric statistics were used for data analyses. The presence of any outliers was assessed prior to data analyses including assessments of normality. Any variable with a value greater than 3 standard deviations from the mean was considered an outlier.

Descriptive statistics were performed on the dependent and independent variables to describe the distribution of the variables (Mean and standard deviation, median and interquartile range [IQR] and frequency with percent) within the data set. To examine bivariate associations between the interval and ratio level independent and dependent variables, two-tailed Pearson correlations and Spearman correlations were assessed. The data was plotted prior to running the correlations to examine the presence of linear relationships.

To examine bivariate associations between categorical independent variables and the dependent variables, two-tailed independent t-tests and one-way analysis of variance (ANOVA) were used. The Levene's test for equality of variances was used to test the assumption of equal variances for the dependent t-test. If the Levene's test was significant, equal variances were not assumed and the t-test value for equal variances not assumed was reported.

One-way ANOVA analyses were run for categorical variables with three or more levels. The Levene's test for equality of variances was used to test the assumption of equal variances prior to running the ANOVA. If the Levene's test was significant, equal variances were not assumed. When equal variances was not assumed, the Brown-Forsythe test statistic for equality of means was reported and the Games-Howell post-hoc test was used to examine where the groups differed. When the assumption of equal

variances was not violated, Tukeys post-hoc tests were used to examine group differences.

Independent variables that were significantly correlated with the dependent variables in the bivariate analyses were entered into separate regression analyses for SEE and BSE, respectively. Age and gender were used as control variables in both models despite a lack of association with SEE or BSE in bivariate analyses. Prior to running the multiple regression models, the validity of the model was assessed. The following were evaluated to ensure that the data was not violating linear multiple regression assumptions: 1) sample size 2) multi-collinearity and singularity ($r>0.90$) 3) multivariate normality 3) Outliers 4) Normality, linearity, homoscedasticity, and independence of residuals.

In regards to sample size, Tabachnick and Fidell's (2013) formula to assess adequate sample size was used: $N > 50+8m$ where m equals the number of independent variables. For the SEE regression model, 12 independent variables were included in the model. According to Tabachnick and Fidell's equation, the minimum sample size requirement for a model with 12 independent variables is 146. For BSE there were 11 total independent variables included in the model. Using Tabachnick and Fidell's equation, the minimum sample size is 133 people. For both the SEE and the BSE regression models, the sample size was N=165 suggesting the sample size assumption was not violated.

To address multi-collinearity and singularity, relationships between the independent variables were examined. Pearson and Spearman correlations were initially used to assess the potential for collinearity. Variables with a Pearson or Spearman correlation of 0.60 or higher were identified as potentially collinear (pain and physical

function). Further collinearity diagnostics were run during the regression analysis and two values, VIF(1/Tolerance) and Tolerance were examined. A tolerance numeric below 0.10 and a VIF above 10 means that there is multicollinearity with the variables (Pallant, 2013). Both models, SEE and BSE, none of the variables came close to these values. Singularity was not a problem within this class of variables; none of the variables were a component of any other variable. It should be noted though that physical function, pain, and negative affect since they were all retrieved from the same survey.

To address outliers, both regression models were run separately and the presence of outliers was examined. Outliers are residual values below or above the best fit-line and have residual values outside of the normal limits that are plotted assessing distribution. (-3.3> or 3.3>). A scatterplot was used to examine homoscedasticity (the variance of the residuals with the dependent variable). For SEE, the scatter plot for the residues were rectangular in distribution, showing minimal evidence for outliers (-3.3> or 3.3>). For BSE, there was not a clear depiction of a rectangular distribution of the residues, yet all outliers remained within normal limits. (-3.3> or 3.3>). To further examine outliers, the Mahalanobis Distance (Mahal. Distance) was examined for significance. A critical value which is calculated by the number of IV/DV that are in each model is compared against the calculated Mahal Distance in SPSS to determine significance. To test the independence of residuals, Cook's distance was examined. The maximum value must be less than one to not violate the assumption and SEE (0.070) and BSE (0.089) were less than one.

To examine independent associations of the independent variables on self-efficacy (SEE and BSE), two multiple linear regression models were run. The multiple

regression analysis allowed examination of the individual associations while controlling for the other independent variables in the model. The significant correlates were entered into the regression model while controlling for age, sex and race. The 23rd edition of SPSS (IBM) was used for all analyses. Significance for all analyses is $p< 0.05$.

CHAPTER 4

RESULTS

There were 244 participants who were sent surveys and a total of 208 participants returned the surveys. Of the 208 surveys, 41 were excluded from the analyses due to missing data on the independent (n=34) or dependent variables (n=7), resulting in complete data on 167 participants.

Participant Characteristics

The majority of the participants were female (85.6%), retired (58.1%), and NHW (62.9%). Nearly 47% were married or living with a partner, and nearly 45% held a Bachelor's degree or higher. The average age of the participants was 66.6 (10.72) years (see Table 1). Based on self-reported height and weights, 46.7% of the sample was classified as obese (BMI $\geq$ 30m^2/kg) and, based on self-reported PA, 68.3% of the sample were not meeting ACSM Physical activity recommendations. Participant characteristics can be found in on Table 1.

As shown in Table 1, the average score reported for pain was 5.18 (2.54) and negative affect was reported as 3.09 (1.63). A lower score of zero was indicative of a good pain score and 10 was indicative of a poor pain score. Negative affect was scored similarly, where zero was lower presence of tension and mood and ten was indicative a poor score for tension and mood. This sample reported having moderate pain and were at the lower end of the spectrum for negative affect. The median for physical function was 1.35 [IQR 1.81]. The participants displayed a mean of 11.6 out of 25 on social support scores, and a mean of 37.6 for outcome expectations out of total score of 45. SEE had a

possible total score of 35, and the average sum of scores was 22.7 (7.9). BSE had a possible total score out of 30, and the average sum of scores was 22.3 (7.18).

Table 1

Participant Characteristics

Characteristics	n (%) or mean (standard deviation)
Sex	
Female	143 (85.6%)
Male	24 (14.4%)
Race	
White	105 (62.9%)
Black	61 (36.5%)
Multiracial	1 (0.6%)
Age (years)	66.7 (10.1)
Education	
High school graduate or	31 (18.6%)
lower	63 (37.7%)
Some college/associates	34 (20.4%)
Bachelor's degree	39 (23.4%)
Master's or higher	
Employment	
Full-time/part-time	44 (26.4%)

Unemployed	15 (9%)
Retired	97 (58.1%)
Homemaker	11 (6.6%)
Marital status	
Married/living with partner	77 (46.1%)
Widowed	39 (23.4%)
Divorced	30 (18%)
Not married	20 (12%)
BMI (kg/ m^2)	
Normal 18-24.9m/kg^2	46 (27.5%)
Overweight 25-29.9 m/kg^2	43 (25.7%)
Obese 30> m/kg^2	78 (46.7%)
Social support (total score=25)	11.63 (3.16)
Outcome expectations (total score=45)	37.6 (5.18)
Perceived physical function (0=good, 10=bad)	1.35 [IQR 1.81]*
Pain (0=good, 10=bad)	5.18 (2.54)
Negative affect (0=good, 10=bad)	3.09 (1.63)
BSE (total=30)	22.6 (7.18)
SEE (total =35)	22.7 (7.9)

*IQR is the interquartile range defined as between the 25th and 75th percentile

Bivariate Associations with SEE

Results from Pearson and Spearman correlations for SEE are presented in Table 2. Significant positive correlates of SEE were outcome expectations for exercise (r = 0.59, $p < 0.001$), social support (r =.135, p=0.043) and total minutes of PA (r = 0.410, p<0.001). Significant negative correlates of SEE were BMI (r=0.219, p=.001), impaired physical function (r = -0.534, p<0.001), negative affect (r = -0.254, p<0.001), and pain (r =-0.408, p<0.001). Impaired physical function was positively and moderately correlated with pain (r= 0.657, p<0.001) and negative affect (r=0.471, p<0.001) (Table 2). BMI had a positive weak to moderate correlation with pain (r=0.257, p<0.001) and had a moderately positive correlation with physical function (r=0.366, p<0.001). BMI had a weak negative correlation with physical activity (r=-.239, p<0.001) and EOE (r=-.176, p=0.11). Pain was weakly and negatively associated with social support (r= -.048, p=.274). EOE was positively and weakly correlated with social support (r= 0.197, p=0.006) and positively weak to moderately associated with physical activity levels (r=0.340, p<0.001).

Table 2

Correlations Between Independent Variables and Self-efficacy for Exercise

Pearson Correlation (Sig One-tailed)	Age	BMI	Physical Function	Negative Affect	Pain	EOE	Social Support	Physical Activity	SEE
Age	___	-.233* ǂ ***p*=.001**	-.135* ǂ *p*=.040	-.199** *p*=**..005**	-1.95** *p*=**.006**	.005 *p*=.476	-.043 *p*=.294	-.146* *p*=**.030**	-.004 *p*=.479
BMI ǂ	___	___	.366** ǂ ***p*<.001**	.175*ǂ ***p*=.012**	.257**ǂ ***p*<.001**	-.176*ǂ ***p*=.011**	.034ǂ *p*=.334	-.239**ǂ ***P*<.001**	-.294**ǂ ***p*<.001**
Physical Function ǂ	___	___	___	.471**ǂ ***p*<.001**	.657**ǂ ***p*<.001**	-.271**ǂ ***p*<.001**	.068ǂ p=.195	-.346**ǂ ***p*<.001**	-.534**ǂ ***p*<.001**
Negative Affect	___	___	___	___	.437** ***p*<.001**	-.154* ***p*=.023**	.100 *p*=.102	-.152* ***p*=.025**	-.254** ***p*<.001**
Pain	___	_____	___	___	___	-.284** ***p*<.001**	-.048 p=.274	-.156* ***p*=.022**	-.408** ***p*<.001**
EOE	___	_____	_____	_____	___	___	.197** ***p*=.006**	.340** ***p*<.001**	.585** ***p*<.001**
Social Support	___	___	___	___	___	___	___	.007 p=.463	.135* ***p*=.043**
Total PA (Minutes)	___	___	___	___	___	___	___	___	.410** ***p*<.001**
SEE	___	___	___	___	___	___	___	___	___

ǂ symbol used to denote skewness: Spearman's rho reported $p<0.05$* and $p<0.001$**

Table 3 and Table 4 report results of bivariate associations for categorical variables with SEE. Individuals who reported meeting the recommendations for PA (M = 25.81 $\pm$ 5.45) reported higher SEE than individuals who did not meet the recommendations (M = 21.11 $\pm$ 7.43; $t_{134.49} = 4.60$, $p < 0.001$). BMI (F=4.32, df 2, p=.015). Employment (F=2.88, df 3, p=0.038) and education level (F=4.19, df 3, p=0.007) were significantly associated with exercise self-efficacy (Table 4). Results from Tukey HSD post hoc analyses for BMI indicated normal weight individuals had a higher SEE than obese individuals (mean difference 3.84; 95% CI = 0.74 – 6.94, p = 0.011). The Games-Howell post-hoc test was used to examine group differences by education level. Individuals who reported a Master's degree or higher had a significantly higher SEE than individuals who reported a high school education or lower (mean difference 5.02, 95% CI= 0.29-9.76, p=.034). Similarly, individuals with a Master's degree or higher reported a significantly higher SEE than individuals with an associate's degree/some college (mean difference 3.74, 95%CI= 0.57-6.92, p =0.014). No other group differences by education level were observed (p> 0.05). In Tukey HSD post hoc analyses for employment, people who reported being employed full-time or part-time displayed higher SEE compared to being homemakers. (mean difference 6.45, 95%CI= 0.27-12.6). SEE was not associated with gender or marital status in bivariate analysis (p > 0.05).

Table 3

Bivariate Analysis with T-test Analyses for SEE

Variable SEE	Mean (*SD*)	Mean difference (95%CI)	*t*-value	*df*	*p*-value
Meets PA recommendations	25.81 (5.45)	4.7 (6.71-2.68)	-4.60	135	<0.001*
Meets physical activity	21.11 (7.43)				
Does not					
Sex		2.39 (1.04-5.83)	1.38	165	0.544
Male	22.00 (6.97)				
Female	22.71 (7.24)				
Race		2.82 (0.57-5.08)	2.48	164	0.014*
NHW	23.68 (6.88)				
NHB	20.85 (7.43)				

Table 4

Bivariate Associations Through One-way ANOVA of SEE

		Sum of squares	df	Mean square	*F*	Sig.
BMI	Between Groups	428.93	2	214.63	4.32	**0.015**
	Within Groups	8140.99	164	49.64		
	Total	8569.92	166			
Educational Level	Between Groups	613.82	3	204.61	4.10	**0.007**
	Within Groups	7956.1	163	48.81		
	Total	8569.92	166			
Employment	Between Groups	431.30	3	143.77	2.76ǂ	**0.038**
	Within Groups	8138.61	163	49.93		
	Total	8569.92	166			

ǂ denotes post-hoc analysis with Brown-Forsythe for violation of assumption for homogeneity

Bivariate Associations with BSE

Spearman and Pearson correlations with BSE are presented in Table 5. Significant positive correlates of BSE were outcome expectations for exercise (r =0.503, p<0.001), social support (r =0.163, p=.043), and total minutes of physical activity (r=.393, p<0.001). Significant negative correlates of barriers self-efficacy were a higher BMI (r= -2.12ǂ, p<0.01), higher impaired physical function (r = -0.457ǂ, p<0.001), higher negative affect (r = -0.33, p<0.001) and higher pain (r= -0.368, p<0.001). BMI was positively and moderately correlated with physical function (r=0.366, p<0.001) and weak to moderately correlated with pain (r=0.257, p<0.001) and negative affect (r=0.175, p=0.012). BMI was negatively and weak to moderately correlated with EOE (r=-.176, p=0.011) and physical activity (r= -.239, p<0.001). Physical function was positively and moderate to strongly correlated with negative affect (r=0.471, p<0.001) and strongly correlated with pain (r=0.657, p<0.001). Physical function was negatively and weak to moderately correlated with EOE (r=-0.271, p<0.001) and moderately correlated with physical activity (r=-0.346, p<0.001). Negative affect is positively and moderately correlated with pain (r=0.437, p<0.001) and negatively and weakly correlated to EOE (r=-0.154, p=0.023), and physical activity (r=-0.152, p=0.25). Pain is negatively and weakly correlated to EOE (r=-0.284, p<0.001) and physical activity (r=-0.156, p=0.22). EOE was positively and weakly correlated with social support (r=0.197, p<0.001) and moderately correlated with physical activity (r=0.340, p<0.001).

Table 5

Correlations between independent variables and Barrier Self-efficacy

Pearson Correlation (Sig One-tailed)	Age	BMI	Physical Function	Negative Affect	Pain	EOE	Social Support	Physical Activity	BSE
Age	___	-.233* ǂ **p=.001**	-.135* ǂ **p=.040**	-.199** **p=.005**	-1.95** **p=.006**	.005 p=.476	-.043 p=.294	-.146* **p=.030**	-.016 p=.417
BMI ǂ	___	___	.366** ǂ **p<.001**	.175*ǂ **p=.012**	.257**ǂ **p<.001**	-.176*ǂ **p=.011**	.034ǂ p=.334	-.239**ǂ **p=.001**	-.212**ǂ **p<.001**
Physical Function ǂ	___	___	___	.471**ǂ **p<.001**	.657**ǂ **p<.001**	-.271**ǂ **p<.001**	.068ǂ p=.195	-.346**ǂ **p<.001**	-.457**ǂ **p<.001**
Negative Affect	___	___	___	___	.437** **p<.001**	-.154* **p=.023**	.100 p=.102	-.152* **p=.025**	-.330** **p<.00**
Pain	___	_____	___	___	___	-.284** **p<.001**	-.048 p=.274	-.156* **p=.022**	-.368** **p<.001**
EOE	___	_____	_____	_____	___	___	.197** **p=.006**	.340** **p<.001**	.503** **p<.001**
Social Support	___	___	___	___	___	___	___	.007 p=.463	.163* **p=.043**
Total PA (Minutes)	___	___	___	___	___	___	___	___	.393** **p<.001**

ǂ symbol used to denote skewness: Spearman's rho reported $p<0.05$* and $p<0.001$**

The results from t-test analyses and one-way ANOVAs are represented in Table 6 and 7, respectively. Individuals who reported meeting the recommendations for PA (*M* = 25.70 ±7.03) reported higher BSE than individuals who did not meet the recommendations (*M* = 21.32 ±1.94; t_{165}= 3.43, *p*=0.001). BSE varied by education level (*F*=4.08, *df* 3, *p*=0.009). Using the Games-Howell post hoc test to analyze group differences with education level, people with a Master's degree reported higher BSE compared to people with a high school degree (mean difference 6.00, 95%CI= 0.66-11.33, *p*=0.022) and people with a Master's degree reported a higher BSE than individuals who reported some college or an associate's degree (mean difference 4.37, 95%CI= 0.75-8.00), *p*=0.011). Race was significantly associated with BSE (t_{164}= 2.34, 95%CI=2.95 (0.46-5.43), p=.021). BSE was not associated with gender, marital status, BMI, or employment (*p*>0.05).

Table 6

Bivariate Associations through T-test Analysis for BSE

Variable		Mean (*SD*)	Mean difference (95%CI)	*t*-value	*df*	*p*-value
Meets PA recommendations						
	Meets PA	25.70 (7.03)	4.37 (6.89- 1.85)	-3.42	165	0.001*
	Does not	21.33 (7.94)				
Sex						
	male	20.67 (8.66)	2.39 (2.43-3.84)	1.38	165	0.171
	female	23.10 (7.76)				
Race						
	NHW	23.78 (7.56)	2.95 (0.46-5.43)	2.34	164	0.021*
	NHB	61 (20.85)				

* $p<0.05$ and $p<0.001$* statistically significant

Table 7

Multivariate Associations of independent variables with BSE

Variable		Sum of squares	df	Mean square	*F*	Sig.
BMI	Between Groups	301.9	2	150.95	2.44	0.091
	Within Groups	8140.99	164	49.64		
	Total	8569.92	166			
Educational Level	Between Groups	762.93	3	254.31	4.08	**0.006**
	Within Groups	9620.43	163	59.02		
	Total	10383.37	166			
Employment	Between Groups	385.80	3	128.6	2.10	0.103
	Within Groups	9997.56	163	61.34		
	Total	10383.37	166			

ǂ denotes post-hoc analysis with Brown-Forsythe for violation of assumption for homogeneity

Table 8

Multivariate Analysis through Multiple Linear Regression Analysis for SEE

Variable	**df**	**beta**	**Semi partial**	***t*-value**	***p*-value**
Age	1	-.069	-0.056	-1.01	0.315
Gender					
female	1	-.031	-0.028	-0.507	0.613
male					
BMI	1	-.114	.-0.092	-1.65	.101
Race					
NHW	1	-.001	-0.001	-0.13	0.990
NHB					
Education	1	0.169	0.155	-1.34	**0.006***
college grad>					
high school					
Employment	1	-0.085	-0.075	-1.34	0.183
black					
white					
Physical	1	0.39	-0.155	-2.76	**.006***
Negative affect	1	-.024	-0.019	-0.348	.729
Pain	1	-.047	.-0.034	-0.600	.549
Social Support	1	.092	.0.87	1.55	.124
EOE	1	.432	0.382	6.83	**<.001***
PA minutes	1	.121	0.104	1.87	.064

Results from the multiple regression analyses for SEE are presented in Table 8. Significant, independent predictors of SEE in multiple regression analyses were EOE (t= 6.83, p<0.001), physical function (t=-2.76, p=0.006), and education level (t=-1.34, p=.006). The entire model accounted for 50.5% of the variance (adjusted R^2= 0.505). Semipartial correlation values suggested EOE was the strongest predictor of SEE, accounting for 14.5% of the unique variance in the model. Physical function and education each accounted for 2.4% of the unique variance in the model

Table 9

Multivariate Analysis Through Multiple Linear Regression Analysis for BSE

Variable	**df**	**beta**	**Semipartial**	**t-value**	**P-value**
Age	1	-.05	-0.05	-0.74	.46
Gender					
female	1	-.09	-0.08	-1.31	.19
male					
BMI	1	-.01	-0.01	-0.16	.88
Race					
NHW	1	-.03	-0.03	-0.47	0.64
NHB					
Education	1	.14	0.13	2.18	**.03***
college grad>					
high school grad<					
Physical function	1	-.22	-0.14	2.36	**.020***
Negative affect	1	-.13	-0.11	-1.83	.070
Pain	1	.26	.-0.004	-0.07	.94
Social Support	1	.14	0.13	2.18	**.031***
EOE	1	.32	.29	4.71	**<.001****
PA minutes	1	.16	0.14	2.31	**.02***

$p<0.05$* and $p<0.001$**

In multiple regression analyses in Table 9 for BSE, significant independent predictors of BSE were education (t= 2.19, p=.037), physical function (t= 2.36, p=.020), social support (t= 2.18, p=.031), EOE (t= 4.71, p=<.001), and total PA(minutes) (t=0.02, p=.022). The entire model accounted for 41.1% of the variance in BSE (adjusted R^2= 0.411). Based on the semi-partial correlation values, EOE accounted for the largest proportion of the unique variance in BSE (8%), followed by physical function (2.04%) , minutes of physical activity (2.0%), education (1.8%), and social support(1.8%).

Table 10

One-Way ANOVA for Regression Analysis of SEE and BSE

		Sum of squares	df	Mean square	*F*	Sig.
SEE	Between Groups	4252.3	12	354.4	14.43	**<.001****
	Within Groups	3583.7	146	24.5		
	Total	7836.0	158			
BSE	Between Groups	4489.6	11	408.1	11.07	**<.001****
	Within Groups	5455.8	148	36.8		
	Total	9945.5	159			

p<0.05* and p<0.001**

The significance for both models, SEE and BSE, are represented above in Table 10. The model for SEE (F= 14.43, p<0.001) and BSE (F=11.07, p<0.001) were both statistically significant for both independent regression models. The adjusted R squared ration accounted for the variance for each model. For SEE, there were 12 independent variables inputted into the model, and the regression showed that these variables accounted for 50.5% (R^2=0.505, F=14.43, p<0.001) of the total variance. The BSE model regression had 11 independent variables inputted into the model, and the regression showed that these variables accounted for 41.1% (R^2= 0.411, F= 11.07, p<0.001) of the total variance.

CHAPTER 5

DISCUSSION

Self-efficacy has been defined as one of the strongest predictors and determinants of exercise initiation and adherence in people with arthritis (Ashford et al., 2010; Wilcox et al., 2005). Yet little is known about the correlates of exercise within this population. To address this gap, this study examined the potential correlates of exercise self- efficacy, with exercise self-efficacy defined in two subtly different ways. This study had three aims. Specific Aim 1 addressed the potential correlates or predictors of self-efficacy for exercise, measured using a scale addressing one's confidence in his/her ability to engage in exercise (Lorig et al., 1989). Specific Aim 2 addressed situational or barriers self-efficacy (BSE), measured with a validated scale that examines an individual's confidence to engage in exercise when barriers are present (Marcus et al., 1992). Specific Aim 3 examined the multivariate associations of independent variables through a multiple regression to identify independent predictors of SEE and BSE.

Specific Aim 1 and 2 (SEE and BSE). Bivariate associations for SEE and BSE were examined. Correlates examined for SEE and BSE included socio-demographic characteristics (age, race, gender, education level), arthritis-related symptoms including pain, negative affect and physical function, exercise outcomes expectations, social support for physical activity, and amount of physical activity in the past week. Both dependent variables were associated with all the independent variables except age. This could be explained due to the selective age group that was included in the study.

Results from bivariate analyses were consistent with the hypotheses. Specifically, education level was a proxy for SES, and correlations showed that higher SES was

positively associated with higher SEE and BSE, just as hypothesized (H1A). Lower educational levels have been associated with lower self-efficacy (Zahodne et al., 2015). Race and gender were also associated with SEE and BSE (H10). Meeting the physical activity recommendations was positively correlated with SEE and BSE (H40). (Bandura, 1997). Literature shows that successful performance of physical activity is associated with higher self-efficacy, and in bivariate analyses, this relationship was observed for both SEE and BSE (Rooks et al., 2007). Physical function, pain, and negative affect were negatively associated with SEE and BSE. This relationship means less pain, better physical function, and lower levels of negative affect were associated with a higher SEE and BSE score. It should be noted that pain and physical function and pain and negative affect were moderately correlated with one another in both models. These variables were retrieved from the AIMS 2 scale, and the variables are highly inter-correlated for assessing arthritis impact (Gignac et al., 2011). Since pain and physical function are the most reported symptoms of arthritis, it can be theorized that these correlates may not be differentiated by the individual responding to the survey. Higher social support and higher outcome expectations were positively associated with higher SEE and BSE (H3A). This was postulated due to positive outcome expectations being a part of Bandura's self-efficacy theory (Bandura, 1989). The more positive outcomes that are expected from a task, then it is associated with higher self-efficacy.

Specific Aim 3. This specific aim was necessary to explore the independent predictors of SEE and BSE through multiple regression analyses. The null hypothesis was: after controlling for other variables in the model, socio-demographic characteristics, physical

states, emotional states, psychosocial characteristics, and physical activity will not independently predict SEE or BSE. This hypothesis was rejected.

In the multiple regression analyses for SEE only education level, physical function and EOE were independent predictors of SEE after controlling for the other variables in the model. Collectively, the model accounted for 50.5% of the variance in SEE. The multiple regression analyses showed education level, physical function, social support, physical activity levels, and EOE were significant predictors of BSE. The BSE model showed that these variables accounted for 41.1% of the total variance. Race, BMI, and gender were not significant predictors in either model. In the present study, after controlling for other variables in the model.

Education level, a proxy for SES, showed higher education level predicted higher SEE and BSE, just as hypothesized (H1A). People with lower education levels were predicted to display lower SEE and BSE. Individuals with a lower education level are more likely to report lower self-efficacy in many tasks, not just with exercise (Zahodne, Nowinski, Gershon, & Manly, 2015). Low education level defined as high school level or lower, has also been associated with poorer health outcomes (Zahodne et al., 2015). Education level may solely be a predictor of SEE and BSE rather than using it as a proxy for income. It is pertinent to understand what other variables influence other barriers associated with lower education level. One theory could be that individuals spend more time working and feel less confident in having enough time being able to exercise when they have to make a living and feed their families. Bandura (1997) discussed that lower self-worth caused by negative environment or lifestyle is associated with lower self-efficacy. Another theory could be with low education level there is less access to learning

and utilizing information, understanding the positive outcome expectations of exercise, the ability to be organized and to stay consistent with exercise, or the ability to sacrifice time in order to exercise due to money or food scarcity (Zahodne et al., 2015). These are examples of possible reasons that education is a significant predictor of both SEE and BSE.

Theory states that successful accomplishment of PA should be associated with exercise self-efficacy. In the present study, physical activity did not predict SEE (H40) (Bandura, 1997). SEE measures the confidence of one's ability to perform the exercise. Literature shows that successful performance of physical activity can predict higher SEE (Rooks et al., 2007). Physical activity was only a significant predictor in the BSE model. Meeting the physical activity recommendations was a predictor for higher BSE. The five-item measure for barrier self-efficacy evaluated how likely an individual was to exercise when it was raining or having enough time (Marcus et al., 1992). An individual may compare this to a past experiences in which they did overcome a barrier experience to exercise. If the person was successfully able to accomplish the task of exercising in the face of barriers this would increase their BSE. It is less likely that how the individual is feeling (i.e., pain, tired, stressed) would influence their perceived confidence to overcome barriers to exercise. The SEE survey assessed how confident a person was to engage in exercise and how confident they could exercise without aggravating their pain (Lorig et al., 1989). Depending on what symptoms they felt at that moment, this may have influenced their confidence to exercise answer. Another theory could be that although individuals can overcome the presences of barriers, they may know the outcomes after exercise, such as increased pain or stiffness, due to past physical activity experiences.

This may also decrease their confidence to exercise. Individuals may be able to overcome getting to the act of exercising, but may not be confident in the ability to exercise due to the effects of exercise.

Physical function predicted both SEE and BSE. This variable contributed to about 2% of the variance within each model. The negative association seen with physical function may be explained by individuals displaying confidence in their ability to overcome their physical function limitations and exercise. If a person has no functional limitations, then he or she would have fewer barriers to overcome. Pain and physical functional impairment were moderately to strongly correlated with each other; however, pain was not a significant predictor in SEE or BSE. This could be explained due to shared variance. Pain and physical function share 43.1% of each other's variance (r=0.657, r2=0.43). A person's level of physical function may be tied to the amount of pain they are experiencing such that those with low levels of pain have higher levels of physical function and vice versa. Since pain and impaired physical function are debilitating symptoms that inhibit exercise, it is important to understand these and how they are related to outcome expectations. It is plausible that individuals with impaired physical function and/or high levels of pain might be less likely to believe they are going to experience benefits from exercise. Likewise, they may not be confident in their ability to engage in sufficient exercise to experience benefits. They may perceive exercise as beneficial but not for them because they can't do it.

EOE was the strongest predictor of SEE, accounting for 14.5% of the unique variance in the model. It was also the strongest predictor for BSE, accounting for 8.2% of the unique variance. This study does emulate similar trends in the literature examining

the relationship between EOE and self-efficacy. In a study done by Ferrier and colleagues (2010) in people with multiple sclerosis (MS), outcome expectations accounted for 8% of the total variance for predicting SEE and physical activity levels. People who reported higher self-efficacy also expected positive outcomes from exercise (Ferrier et al., 2010). Having higher outcome expectations for exercise may be attributable to having more knowledge about the benefits of exercise. Barriers that could negatively affect outcome expectations may be lower education level, low self-worth, low physical function, high amounts of pain; all of which can elicit negative outcome expectations for exercise. Although an individual may have confidence to overcome barriers to exercise because they know exercise is beneficial, they may not be able to overcome other psychosocial and physical barriers. Individuals who are more confident in engaging in exercise are more likely to be physically active and more likely to expect positive outcomes in exercise (Ferrier et al., 2010). There are associations between EOE and SEE, but it is unknown which variable changes the other. In a study done by Williams (2010), he evaluated the relationship between outcome expectations and self-efficacy and challenged Bandura's theory that outcome expectations are not part of the self-efficacy framework, but they are independent and either may change one another. Bandura states that outcome expectations do not have causal associations with self-efficacy; however, there may be a causal relationship if evaluated through a longitudinal study. Changes in self-efficacy could be assessed with changes in outcome expectations for exercise.

Social support was not a significant predictor of SEE, but was a predictor of BSE. Individuals who report receiving more social support or verbal persuasion for physical activity had a higher BSE. However, social support was not a significant

predictor of self-efficacy for exercise. Pennix and colleagues (1999) state that rather than being a predictor of self-efficacy of exercise, self-efficacy should be considered as a motivating factor. Having friends or family being able to motivate exercise will more likely aid in overcoming the barriers of time, mood, and weather. Although the individual may be more confident to engage in activity at that time, they may still not be confident in engaging in exercise.

Limitations

The major limitation of this study was its cross-sectional design. Because of this, temporal sequence and causal relationships between the variables could not be determined. Additionally, potentially confounding variables were not controlled for in this study. However, the study was exploratory in nature examining the correlates of exercise self-efficacy in people with arthritis. To the best of our knowledge, this is the first study to examine this outcome in people with arthritis and the study provides us with an understanding of the factors that may be associated with exercise self-efficacy. Other limitations of this study included a sample that was predominantly female and all independent and dependent variables were self-reported. Participants may have over or underestimated the variables. Additionally, given the cross-sectional nature of this study, vicarious learning was not addressed as a correlate of exercise self-efficacy in this study. This is an important oversight given that Bandura's theory of self-efficacy states that individuals increase their confidence to engage in behaviors by observing others successfully engaging in the behavior. This construct was not possible to study with a cross-sectional design.

Implications

This study identified several predictors of SEE and BSE. Outcome expectations was the strongest predictor of both SEE and BSE in people with arthritis, suggesting that a positive perception of the outcomes of exercise is important for increasing one's confidence to exercise and one's confidence to exercise when barriers are present. Physical function was also an important predictor of SEE and BSE albeit accounting form a much smaller portion of the variance. Individuals with arthritis experience chronic pain and many develop physical limitations. These both may independently influence peoples' exercise expectations and their confidence to exercise. Identifying realistic and obtainable exercise outcome expectations may be critical for increasing exercise self-efficacy and motivation to exercise. More research is warranted to examine the relationship between exercise outcome expectations and self-efficacy for exercise using a prospective design. A longitudinal approach is necessary to understand the temporal relationship between these constructs.

Self-efficacy is a strong predictor of exercise and increasing self-efficacy is an important element of interventions focusing on physical activity promotion in people with arthritis. Enhancing self-efficacy may lead to increased exercise participation in people with arthritis. However, the best way to increase exercise self-efficacy is not necessarily clear. Understanding the relationship between self-efficacy and outcome expectations, independent of one another, should be evaluated. Physical activity participation is a large problem among individuals with arthritis, and this needs to be incorporated into daily life to improve symptoms, reduce health care cost, and improve overall health benefits.

Future Direction and Recommendations

This particular study could not examine the temporal relationship between SE and EOE due to its cross-sectional design; however a longitudinal study can examine this issue. This study displayed that outcome expectations are an important predictor of barrier self-efficacy and self-efficacy for exercise. Future recommendations should lean towards examining a sample within a longitudinal study to see if a change in outcome expectations causes significant changes in self-efficacy.

Due to the debilitating nature and the high societal cost of arthritis, it is important to continue to examine effective ways to increase physical activity participation in people with arthritis. Understanding how education, physical function/pain, social support, EOE, and prior physical activity levels may enhance self-efficacy for exercise and ultimately exercise participation may help to develop more effective exercise interventions. Individuals with lower education levels are less active than those with higher education levels. Our findings suggest that lower education may also be predictive of SE even after controlling for current physical activity. Understanding why education level may independently exert an effect on exercise self-efficacy may allow for more tailored interventions. Outcome expectations is a strong predictor of SEE and BSE but the direction of the relationship is not clear. Longitudinal studies examining the temporal sequence are necessary to examine if there is a causal relationship between EOE and SE. Postulating that outcome expectations indeed effects self-efficacy for exercise, it is crucial to find ways to decrease negative outcome expectations and create interventions to enhance positive and realistic outcome expectations. Mindfulness, which is a practice that is meant to facilitate non-judgmental attention specifically during the current

moment experience through the practice of meditation, can be a crucial next step to analyze pain management, physical function, and how these affect outcome expectations to exercise (Surawy et al., 2005). Although these correlates are difficult to assess, due to pain and physical function being subjective, mindfulness may aid in the personal management of pain and physical function. This study highlighted what variables were important with self-efficacy and what the next steps are in order to improve self-efficacy and barrier self-efficacy.

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APPENDIX A

INFORMED CONSENT

University of Illinois at Chicago
Consent for Participation in Research
"Factors that influence exercise participation in a diverse population with arthritis"

Why am I being asked?

You are being asked to be a subject in a research study about the factors that influence exercise among minorities with arthritis that is being conducted by Dr. Cheryl Der Ananian through the Health Research and Policy Centers here at the University of Illinois at Chicago. You are here today because you recently participated in a survey regarding factors that may influence exercise participation and expressed an interest in participating in an interview to help us learn more about what factors influence your decision to participate in physical activity. We ask that you read this form and ask any questions you may have before agreeing to be in the research.

Your participation in this research is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University. If you decide to participate, you are free to withdraw at any time without affecting that relationship.

Regular participation in exercise has been shown to reduce pain, delay disability, improve mobility and improve quality of life for people with arthritis. Yet fewer people with arthritis take part in regular exercise compared to people without arthritis. Moreover, minorities with arthritis have the lowest rates of exercise participation. As such, it is important to understand what factors (e.g., barriers, motivators, and personally meaningful outcomes) are related to exercise participation among minorities. As part of this study, we are conducting in-depth interviews with minorities with arthritis to get a better understanding of their reasons for taking part in exercise or for not exercising. We will discuss issues related to exercise including the reasons why you choose to exercise, perceived barriers to exercise, perceived benefits of exercise, what outcomes you would like to obtain from exercise and features of community-based exercise programs that may influence exercise participation.

The purpose of this research is to learn more about what gets in the way of physical activity (exercise) among minorities with arthritis, what helps or motivates people with arthritis to be physically active and what outcomes of exercise are most meaningful to people with arthritis.

What procedures are involved?

If you agree to participate in this research, you will participate in an interview that will last 60-9(minutes. A topic for discussion will be introduced, and then we will ask you to discuss the issue. There are no right or wrong answers; we are interested in your opinions. The discussion will be tape recorded and we will be taking notes to make sure we don't miss what you say. Approximately 30 people will participate in interviews similar to the one we are having today. All of the people participating in the interviews will be people who recently completed a survey about potential factors related to exercise and their exercise habits.

The discussion today will focus on factors that are potentially related to exercise. You will be asked to discuss what gets in the way of exercise, what you hope to get out of exercise, what motivates you to exercise, what programs exist within your community for exercise and the types of exercise advice you have received.

What are the potential risks and discomforts?

There are minimal potential risks or discomforts related to your participation in the interview. If we bring up a topic that you are uncomfortable discussing, you can choose not to talk. You may also excuse yourself from the interview at any time if the discussion makes you upset or uncomfortable.

Are there benefits to taking part in the research?

There are no direct benefits for your participation in this research.

What about privacy and confidentiality?

The only people who will know that you are a research subject are members of the research team. No information about you, or provided by you during the research, will be disclosed to others without your written permission.

When the results of the research are published or discussed in conferences, no information will be included that would reveal your identity. Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Audiotapes will be stored in a locked drawer in the research office and will be destroyed after transcripts of the discussions have been created and

What are the costs for participating in this research?

There are no costs for participation in this research.

Will I be reimbursed for any of my expenses or paid for my participation in this research?

You will receive $20 in compensation for your participation in the interview.

Who should I contact if I have questions?

The researchers conducting this study are Cheryl Der Ananian, PhD and Thomas Prohaska, PhD You may ask any questions you have now. If you have questions later, you may contact the researchers at (312) 996-5897.

What are my rights as a research subject?

If you have any questions about your rights as a research subject, you may call the Office for Protection of Research Subjects at 312-996-1711.

As an UIC employee

Your participation in this research is in no way a part of your university duties, and your refusal to participate will not in any way affect your employment with the university, or the benefits, privileges, or opportunities associated with your employment at UIC. You will not be offered or receive any special consideration if you participate in this research.

What if I am a UIC student?

You may choose not to participate or to stop your participation in this research at any time. This will not affect your class standing or grades at UIC. The investigator may also end your participation in the research. If this happens, you class standing or grades will not be affected. You will not be offered or receive any special consideration if you participate in this research.

Remember: Your participation in this research is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University. If you decide to participate, you are free to withdraw at any time without affecting that relationship.
You will be given a copy of this form for your information and to keep for your records.

Signature of Subject

I have read (or someone has read to me) the above information. I have been given an opportunity to ask questions and my questions have been answered to my satisfaction. I agree to participate in this research. I have been given a copy of this form.

_____ _____

Signature Date

_____

Printed Name

_____ _____

Signature of Researcher Date (must be same as subject's)

APPENDIX B

AIMS2 SURVEY

ARTHRITIS IMPACT MEASUREMENT SURVEY (AIMS 2)

ID:_____

Date:_____
Month Day Year

Instructions: Please answer the following questions about your health. Most questions ask about your health in the past month. There are no right or wrong answers to the questions and most can be answered by filling in the bubbles. The questions are on both sides of the paper. Please answer every question.

If you have any questions about this survey, please feel free to call Cheryl at 312-996-5897.
THANK YOU

ID:

Please fill in the bubble for the most appropriate answer for each question.

These questions refer to MOBILITY LEVEL.

During the past month…	All days (1)	Most days (2)	Some days (3)	Few days (4)	No Days (5)
1. How often were you physically able to drive a car or use public transportation?	○	○	○	○	○
2. How often were you out of the house for at least part of the day?	○	○	○	○	○
3. How often were you able to do errands in your neighborhood?	○	○	○	○	○
4. How often did someone have to assist you to get around outside your home?	○	○	○	○	○
5. How often were you in a bed or chair for most or all of the day?	○	○	○	○	○

These questions refer to WALKING & BENDING.

During the past month…	All days (1)	Most days (2)	Some days (3)	Few days (4)	No Days (5)
6. Did you have trouble doing vigorous activities such as running, lifting heavy object or participating in strenuous sports?	○	○	○	○	○
7. Did you have trouble either walking several blocks or climbing a few flights of stairs?	○	○	○	○	○
8. Did you have trouble bending, lifting, or stooping?	○	○	○	○	○
9. Did you have trouble either walking one block or climbing one flight of stairs?	○	○	○	○	○
10. Were you unable to walk unless assisted by another person or a cane, crutches or walker?	○	○	○	○	○

Please bubble in the most appropriate answer for each question.

ID:

These questions refer to HAND AND FINGER FUNCTION.

During the past month…	All days (1)	Most days (2)	Some days (3)	Few days (4)	No Days (5)
11. Could you easily write with a pen or pencil	○	○	○	○	○
12. Could you easily button a shirt or blouse?	○	○	○	○	○
13. Could you easily turn a key in a lock?	○	○	○	○	○
14. Could you easily tie a knot or a bow?	○	○	○	○	○
15. Could you easily open a new jar of food?	○	○	○	○	○

These questions refer to ARM FUNCTION.

During the past month…	All days (1)	Most days (2)	Some days (3)	Few days (4)	No Days (5)
16. Could you easily wipe your mouth with a napkin?	○	○	○	○	○
17. Could you easily put on a pullover sweater?	○	○	○	○	○
18. Could you easily comb or brush your hair?	○	○	○	○	○
19. Could you easily scratch your low back with your hand?	○	○	○	○	○
20. Could you easily reach shelves that were above your head?	○	○	○	○	○

YOU ARE DOING A GREAT JOB!!! KEEP UP THE GOOD WORK!

Please fill in the bubble for the most appropriate answer for each question.

ID:

These questions refer to SELF-CARE TASKS.

During the past month…	Always (1)	Very Often (2)	Sometimes (3)	Almost Never (4)	Never (5)
21. Did you need help to take a bath or shower?	○	○	○	○	○
22. Did you need help to get dressed?	○	○	○	○	○
23. Did you need help to use the toilet?	○	○	○	○	○
24. Did you need help to get in or out of the bed?	○	○	○	○	○

These questions refer to HOUSEHOLD TASKS.

During the past month…	Always (1)	Very Often (2)	Sometimes (3)	Almost Never (4)	Never (5)
25. If you had the necessary transportation could you go shopping for groceries without help?	○	○	○	○	○
26. If you had kitchen facilities, could you prepare your own meals without help?	○	○	○	○	○
27. If you had household tools and appliances, could you do your own housework without help?	○	○	○	○	○
28. If you had laundry facilities, could you do your own laundry without help?	○	○	○	○	○

ID:

Please fill in the bubble for the most appropriate answer for each question.

These questions refer to SOCIAL ACTIVITY.

During the past month…	All days (1)	Most days (2)	Some days (3)	Few days (4)	No Days (5)
29. How often did you get together with friends or relatives?	○	○	○	○	○
30. How often did you have friends or relatives over to your home?	○	○	○	○	○
31. How often did you visit your friends or relatives at their homes?	○	○	○	○	○
32. How often were you on the telephone with close friends or relatives?	○	○	○	○	○
33. How often did you go to a meeting of a church, club, team or other group?	○	○	○	○	○

These questions refer to support from FAMILY AND FRIENDS:

During the past month…	All days (1)	Most days (2)	Some days (3)	Few days (4)	No Days (5)
34. Did you feel that your family or friends would be around if you needed assistance or help?	○	○	○	○	○
35. Did you feel that your family or friends were sensitive to your personal needs?	○	○	○	○	○
36. Did you feel that your family or friends were interested in helping you solver your problems?	○	○	○	○	○
37. Did you feel that your family or your friends understood the effects of your arthritis?	○	○	○	○	○

YOU ARE DOING GREAT! WE APPRECIATE YOUR HELP!

Please fill in the bubble for the most appropriate answer for each question.

These questions refer to ARTHRITIS PAIN.

During the past month…	Severe (1)	Moderate (2)	Mild (3)	Very Mild (4)	None (5)
38. How would you describe the arthritis pain you usually had?	○	○	○	○	○
	All days (1)	**Most days (2)**	**Some days (3)**	**Few days (4)**	**No Days (5)**
39. How often did you have severe pain from your arthritis?	○	○	○	○	○
40. How often did you have pain in two or more joints at the same time?	○	○	○	○	○
41. How often did you have morning stiffness that lasted for more than one hour from the time you woke up?	○	○	○	○	○
42. How often did your pain make it difficult for you to sleep?	○	○	○	○	○

These questions refer to WORK:

During the past month…	Paid work (1)	House work (2)	Un-employed (3)	Disabled (4)	Retired (5)
43. What has been your main form of work?	○	○	○	○	○
IF you answered unemployed, disabled or retired, please skip the next four questions and GO TO QUESTION 48 on the next page					

These questions refer to WORK:

During the past month…	All days (1)	Most days (2)	Some days (3)	Few days (4)	No Days (5)
44. How often were you unable to do any paid work, housework or school work?	○	○	○	○	○
45. On the days that you did work, how often did you have to work a shorter day?	○	○	○	○	○
46. On the days that you did work, how often were you unable to do your work as carefully and accurately as you would like?	○	○	○	○	○
47. On the days that you did work, how often did you have to change the way your paid work or housework is usually done?	○	○	○	○	○

These questions refer to LEVEL OF TENSION.

During the past month…	Always (1)	Very Often (2)	Sometimes (3)	Almost Never (4)	Never (5)
48. How often have you felt tense or high strung?	○	○	○	○	○
49. How often have you been bothered by nervousness or nerves?	○	○	○	○	○
50. How often were you able to relax without difficulty?	○	○	○	○	○
51. How often have you felt relaxed and free of tension?	○	○	○	○	○
52. How often have you felt calm and peaceful?					

YOU ARE MORE THAN HALF WAY DONE! KEEP UP THE

Please fill in the bubble for the most appropriate answer for each question.

ID:

<u>These questions refer to MOOD.</u>

During the past month…	Always (1)	Very Often (2)	Sometimes (3)	Almost Never (4)	Never (5)
53. How often have you enjoyed the things you do?	○	○	○	○	○
54. How often have you been in low or very low spirits?	○	○	○	○	○
55. How often did you feel that nothing turned out the way you wanted it to?	○	○	○	○	○
56. How often did you feel that others would be better off if you were dead?	○	○	○	○	○
57. How often did you feel so down in the dumps that nothing would cheer you up?	○	○	○	○	○

Please go to page 9.

THANKS FOR ALL YOUR ANSWERS!

Please fill in the bubble for the most appropriate answer for each question.

ID:

These questions refer to SATISFACTION WITH EACH HEALTH AREA.

58. During the past month, how satisfied have you been with each of these areas of your health?	**Very Satisfied (1)**	**Some-what Satisfied (2)**	**Neither Satisfied nor Dissatisfied (3)**	**Somewhat Dis-satisfied (4)**	**Very Dis-satisfied (5)**
a) Mobility Level (example: do errands)	○	○	○	○	○
b) Walking and Bending (example: climb stairs)	○	○	○	○	○
c) Hand and Finger Function (example: Tie a bow)	○	○	○	○	○
d) Arm Function (example: comb hair)	○	○	○	○	○
e) Self-Care (example: take bath)	○	○	○	○	○
f) Household tasks (example: housework)	○	○	○	○	○
g) Social Activity (example: visit friends)	○	○	○	○	○
h) Support from family (example: help with problems)	○	○	○	○	○
i) Arthritis Pain (example: joint pain)	○	○	○	○	○
j) Work (example: reduce hours)	○	○	○	○	○
k) Level of tension (example: felt tense)	○	○	○	○	○
l) Mood (example: down in the dumps)	○	○	○	○	○

Please fill in the bubble for the most appropriate answer for each question.

ID:

These questions refer to ARTHRITIS IMPACT ON EACH AREA OF HEALTH.

59. During the past month, how much of your problem in each area of health was due to your arthritis?	**Not a problem for me (0)**	**Due entirely to other causes (1)**	**Due largely to other causes (2)**	**Due Partly to Arthritis and Partly to other causes (3)**	**Due largely to my arthritis (4)**	**Due entirely to my arthritis (5)**
a) Mobility Level (example: do errands)	○	○	○	○	○	○
b) Walking and Bending (example: climb stairs)	○	○	○	○	○	○
c) Hand and Finger Function (example: Tie a bow)	○	○	○	○	○	○
d) Arm Function (example: comb hair)	○	○	○	○	○	○
e) Self-Care (example: take bath)	○	○	○	○	○	○
f) Household tasks (example: housework)	○	○	○	○	○	○
g) Social Activity (example: visit friends)	○	○	○	○	○	○
h) Support from family (example: help with problems)	○	○	○	○	○	○
i) Arthritis Pain (example: joint pain)	○	○	○	○	○	○
j) Work (example: reduce hours)	○	○	○	○	○	○
k) Level of tension (example: felt tense)	○	○	○	○	○	○
l) Mood (example: down in the dumps)	○	○	○	○	○	○

You have now answered questions about different areas of your health. These areas are listed below.

ID:

lease bubble in up to THREE (3) AREAS in which you would MOST LIKE TO SEE IMPROVEMENT. Please read all 12 areas of health before making your decisions but please only bubble in the 3 AREAS IN WHICH YOU'D MOST LIKE TO SEE IMPROVEMENT.

60. Areas of Health	Three Areas for Improvement
a) **Mobility Level** (example: do errands)	○
b) **Walking and Bending** (example: climb stairs)	○
c) **Hand and Finger Function** (example: Tie a bow)	○
d) **Arm Function** (example: comb hair)	○
e) **Self-Care** (example: take bath)	○
f) **Household tasks** (example: housework)	○
g) **Social Activity** (example: visit friends)	○
h) **Support from family** (example: help with problems)	○
i) **Arthritis Pain** (example: joint pain)	○
j) **Work** (example: reduce hours)	○
k) **Level of tension** (example: felt tense)	○
l) **Mood** (example: down in the dumps)	○

YOU ARE ALMOST DONE. PLEASE KEEP UP THE GOOD WORK!!

THANK YOU.

11

Please fill in the bubble for the most appropriate answer for each question.

ID:

These questions refer to YOUR CURRENT AND FUTURE HEALTH.

	Excellent (1)	Good (2)	Fair (3)	Poor (4)
61. **In general, would you say your HEALTH NOW is excellent, good, fair or poor?**	○	○	○	○

	Very Satisfied (1)	Somewhat Satisfied (2)	Neither Satisfied nor Dissatisfied (3)	Somewhat Dissatisfied (4)	Very Dissatisfied (5)
62. **How satisfied are you with your HEALTH NOW?**	○	○	○	○	○

	Not a problem for me	Due entirely to other causes	Due largely to other causes	Due partly to arthritis and partly to other causes	Due largely to my arthritis	Due entirely to my arthritis
63. **How much of your problems with your HEALTH NOW is due to your arthritis?**	○	○	○	○	○	○

	Excellent (1)	Good (2)	Fair (3)	Poor (4)
64. **In general, do you expect that your HEALTH 10 YEARS FROM NOW will be excellent, good, fair or poor?**	○	○	○	○

	No problem at all	Minor problem	Moderate problem	Major Problem
65. **How big a problem do you expect your arthritis to be 10 YEARS FROM NOW?**	○	○	○	○

Please fill in the bubble for the most appropriate answer for each question.

ID:

This question refers to OVERALL ARTHRITIS IMPACT.

66. **CONSIDERING ALL THE WAYS THAT YOUR ARTHRITIS AFFECTS YOU, how well are you doing compared to people your age?**	Very well	Well	Fair	Poor	Very Poorly
	○	○	○	○	○

67. **What is the MAIN kind of arthritis that you have?**	**YES**	**NO**
a) Rheumatoid Arthritis	○	○
b) Osteoarthritis/ Degenerative Arthritis	○	○
c) Lupus	○	○
d) Fibromyalgia	○	○
e) Scleroderma	○	○
f) Psoriatic Arthritis	○	○
g) Gout	○	○
h) Other	○	○

68. **HOW MANY YEARS HAVE YOU HAD ARTHRITIS?** _____

69. **During the past month…. How often have you had to take MEDICATION for your arthritis?**	All days (1)	Most Days (2)	Some Days (3)	Few Days (4)	No Days (5)
	○	○	○	○	○

ID:

Please bubble in yes or no for each question.

70. **Is your health currently affected by any of the following medical problems?**	**YES**	**NO**
a) High blood pressure	○	○
b) Heart Disease	○	○
c) Mental Illness	○	○
d) Diabetes	○	○
e) Cancer	○	○
f) Alcohol or Drug Use	○	○
g) Lung Disease	○	○
h) Kidney Disease	○	○
i) Liver Disease	○	○
j) Ulcer or other stomach disease	○	○
k) Anemia or other blood disease	○	○
	YES	**NO**
71. Do you take medicine every day for any problem other than your arthritis?	○	○
	YES	**NO**
72. Did you see a doctor more than 3 times last year for any problem other than arthritis?	○	○

APPENDIX C

ARTHRITIS STUDY SURVEY

Arthritis Study Survey

Please complete the following survey. This information will help us better understand the information we learn from the discussions. **Please do not write your name on this survey!**

1a. What is your age? _____ years
1b. How old do you feel? _____ years

2. What is your sex?
   - ❑ Female
   - ❑ Male

3. What is your racial background?
   - ❑ White, not of Hispanic origin
   - ❑ Black or African American, not of Hispanic origin
   - ❑ Asian or Pacific Islander
   - ❑ Hispanic
   - ❑ American Indian or Alaskan Native
   - ❑ Other

4. What is your marital status?

   - ❑ Married
   - ❑ Widowed
   - ❑ Separated
   - ❑ Divorced
   - ❑ Not Married
   - ❑ Not married, but living with a partner

5. Which of the following best describes your current employment status?

   - ❑ Employed full-time
   - ❑ Unemployed
   - ❑ Homemaker
   - ❑ Retired
   - ❑ Student
   - ❑ Employed part-time: _____ hours per week

6. What is your weight in pounds? _____ pounds

7. What is your height in feet and inches? _____ feet_____ inches

8. In a usual week, do you do any activities designed to increase muscle strength or tone, such as lifting weights, pull-ups, push-ups, or sit-ups?

- ❑ No (go to question 9)
- ❑ Yes

8a. How many days per week do you do these activities?

___ Days per week

8b. On days when you do activities to increase muscle strength, how much total time per day do you spend doing these activities?

___ ___ ___ minutes per day

9. We are interested in two types of physical activity - vigorous and moderate. Vigorous activities cause large increases in breathing or heart rate while moderate activities cause small increases in breathing or heart rate.

Now, thinking about the moderate activities you do when you are not working...
In a usual week, do you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, or anything else that causes small increases in breathing or heart rate?

- ❑ No (go to question 10)
- ❑ Yes

9a. How many days per week do you do these moderate activities for at least 10 minutes at a time?

___ Days per week

9b. On days when you do moderate activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?

___ ___ ___ minutes per day

10. Now, thinking about the vigorous activities you do when you are not working.... In a usual week, do you do vigorous activities for at least 10 minutes at a time, such as running, aerobics, or anything else that causes large increases in breathing or heart rate?

- ❑ No (go to question 11)
- ❑ Yes

10a. How many days per week do you do these vigorous activities for at least 10 minutes at a time?

___ Days per week

10b. On days when you do vigorous activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?

___ ___ ___ minutes per day

11. What is your zip code? ___ ___ ___ ___ ___

12. How many adults (18+ years of age), INCLUDING YOURSELF, live in your home?

1 2 3 4 5 6 7 8 9 10+

13. How many children (under age 18) live in your home?

0 1 2 3 4 5 6 7 8 9 10+

14. What is your total yearly household/family income from all sources?

- ❑ $ 0-9,999
- ❑ $ 10, 000-19,999
- ❑ $ 20,000-29,999
- ❑ $ 30, 000-39,999
- ❑ $ 40,000-49,999
- ❑ $ 50,000-59,999
- ❑ $ 60,000-69,999
- ❑ $ 70,000-79,999
- ❑ $ 80,000+

15. Please list all of the medications you are taking (by name), and the reason for the medication (e.g., high blood pressure, arthritis, etc.)

Medication: Reason for Medication:

_____

_____

_____

_____

16. Have you seen a general health/primary care provider in the past year?

- ❑ No (go to question 17)
- ❑ Yes

16b. Did s/he recommend or discuss exercise with you?

- ❑ No (go to question 17)
- ❑ Yes

16 c. Did s/he recommend discuss the following things about exercise with you?

Type of exercise you should be doing? ☐ yes ☐no

Intensity (how hard) of exercise you should be doing? ☐ yes ☐no

Duration (length of exercise) you should be doing? ☐ yes ☐no

16d. Please describe what s/he recommended.
Type of exercise: _____

Intensity of exercise: _____

Duration (how long) to exercise: _____

Other things about exercise?: _____

16e. Has your doctor ever told you not to exercise because of your arthritis? ☐ yes ☐no

17. Have you seen a rheumatologist in the past year?

❑ No (go to question 18)
❑ Yes

17b. Did s/he recommend or discuss physical activity or exercise with you?

❑ No (go to question 18)
❑ Yes

17 c. Did s/he recommend discuss the following things about exercise with you?
Type of exercise you should be doing? ☐ yes ☐no

Intensity (how hard) of exercise you should be doing? ☐ yes ☐no

Duration (length of exercise) you should be doing? ☐ yes ☐no

17d. Please describe what s/he recommended.
Type of exercise: _____

Intensity of exercise: _____

Duration (how long) to exercise: _____

Other things about exercise?: _____

17e. Has your doctor ever told you not to exercise because of your arthritis? ☐ yes ☐no

Self-Efficacy for Exercise

Now we'd like to know about your confidence to take part in regular physical activity in different situations. Please rate your confidence from 1 to 7, with 1 being "not at all confident" and 7 being "very confident." You can circle any number from 1 to 7.

18. I am confident I can participate in regular physical activity when I am tired.

Not at all Confident						Very Confident
1	2	3	4	5	6	7

19. I am confident I can participate in regular physical activity when I am in a bad mood.

Not at all Confident						Very Confident
1	2	3	4	5	6	7

20. I am confident I can participate in regular physical activity when I feel I don't have the time.

Not at all Confident						Very Confident
1	2	3	4	5	6	7

21. I am confident I can participate in regular physical activity when I am on vacation.

Not at all Confident						Very Confident
1	2	3	4	5	6	7

22. I am confident I can participate in regular physical activity when it is raining or snowing or the weather is bad.

Not at all Confident						Very Confident
1	2	3	4	5	6	7

23. How confident are you that you could exercise more if you wanted to?

- ❑ Very confident
- ❑ Somewhat confident
- ❑ Not at all confident

Social Support for Exercise

We'd like to ask you about the support you get for physical activity. After you read each statement, please check whether you strongly agree, agree, disagree or strongly disagree with it.

24. If I had someone like a friend or family member to be physically active with, chances are that I would be more physically active.

strongly agree	agree	disagree	strongly disagree
☐ ☐	☐	☐	

25. My friends encourage me to be physically active.

strongly agree	agree	disagree	strongly disagree
☐ ☐	☐	☐	

26. I have at least one friend who would commit to engaging in physical activity with me.

strongly agree	agree	disagree	strongly disagree
☐	☐	☐	☐

27. Relatives encourage me to be physically active.

strongly agree	agree	disagree	strongly disagree
☐	☐	☐	☐

28. I have at least one relative who would commit to engaging in physical activity with me.

strongly agree	agree	disagree	strongly disagree
☐	☐	☐	☐

Outcome Expectations for Exercise

Finally, we'd like to ask you about what you think exercise can do for you, that is, what your exercise expectations are. Read each statement and then indicate whether you strongly agree, agree, neither agree nor disagree, disagree or strongly disagree.

29. Exercise makes me feel better physically.

strongly agree	agree	Neither agree nor disagree	disagree	strongly disagree
☐	☐	☐	☐	☐

30. Exercise makes my mood better in general.

strongly agree	agree	Neither agree nor disagree	disagree	strongly disagree
☐	☐	☐	☐	☐

ID:_____

31. Exercise helps me feel less tired.

strongly agree	agree	Neither agree nor disagree	disagree	strongly disagree
☐	☐	☐	☐	☐

32. Exercise makes my muscles stronger.

strongly agree	agree	Neither agree nor disagree	disagree	strongly disagree
☐	☐	☐	☐	☐

33. Exercise is an activity I enjoy doing.

strongly agree	agree	Neither agree nor disagree	disagree	strongly disagree
☐	☐	☐	☐	☐

34. Gives me a sense of personal accomplishment.

strongly agree	agree	Neither agree nor disagree	disagree	strongly disagree
☐	☐	☐	☐	☐

35. Exercise makes me more alert mentally.

strongly agree	agree	Neither agree nor disagree	disagree	strongly disagree
☐	☐	☐	☐	☐

36. Exercise improves my endurance in performing my daily activities.

strongly agree	agree	Neither agree nor disagree	disagree	strongly disagree
☐	☐	☐	☐	☐

37. Exercise helps to strengthen my bones.

strongly agree	agree	Neither agree nor disagree	disagree	strongly disagree
☐	☐	☐	☐	☐

N) LORIG SELF-EFFICACY TO PERFORM SELF-MANAGEMENT BEHAVIORS: SE EXERCISE REGULARLY

We would like to know how confident you are in doing certain activities. For each of the following questions, please circle the number that corresponds to your **confidence that you can do the tasks regularly at the present time.**

1. How confident are you that you can...
do gentle exercises for muscle strength and flexibility 3 to 4 times per week (range of motion, using weights, etc.)?

Not at all confident	1	2	3	4	5	6	7	8	9	10	Totally confident

2. How confident are you that you can...
do an aerobic exercise such as walking, swimming, or bicycling 3 to 4 times each week?

Not at all confident	1	2	3	4	5	6	7	8	9	10	Totally confident

3. How confident are you that you can...
exercise without making your symptoms worse?

Not at all confident	1	2	3	4	5	6	7	8	9	10	Totally confident

O) LORIG SELF-EFFICACY [ARTHRITIS] PAIN

In the following questions, we'd like to know **how your arthritis pain affects you.** For each of the following questions, please **circle one number** which corresponds to your certainty that you can now perform the following tasks:

1. How certain are you that you can decrease your pain quite a bit?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

2. How certain are you that you can continue most of your daily activities?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

3. How certain are you that you can keep arthritis pain from interfering with your sleep?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

4. How certain are you that you can make a small-to-moderate reduction in your arthritis pain by using methods other than taking extra medication?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

5. How certain are you that you can make a large reduction in your arthritis pain by using methods other than taking extra medication?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

OFFICE USE ONLY. *Scoring: The score is the mean of the five items. If more than one-fourth of the data are missing, set the value for this scale to missing. Scores range from 10 to 100, with a higher score indicating a greater self-efficacy.*

P) LORIG SELF-EFFICACY OTHER [ARTHRITIS] SYMPTOMS

In the following questions, we'd like to know **how you feel about your ability to control your arthritis.** For each of the following questions, please **circle one number** which corresponds to the certainty that you can now perform the following activities or tasks.

1. How certain are you that you can control your fatigue?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

2. How certain are you that you can regulate your activity so as to be active without aggravating your arthritis?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

3. How certain are you that you can do something to help yourself feel better if you are feeling blue?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

4. As compared with other people with arthritis like yours, how certain are you that you can manage arthritis pain during your daily activities?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

5. How certain are you that you can manage your arthritis symptoms so that you can do the things you enjoy doing?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

6. How certain are you that you can deal with the frustration of arthritis?

10	20	30	40	50	60	70	80	90	100
very uncertain				moderately uncertain					very certain

OFFICE USE ONLY

Scoring: The score is the mean of the six items. If more than one-fourth of the data are missing, set the value for this scale to missing. Scores range from 10 to 100, with a higher score indicating a greater self-efficacy.