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The Impact of Arthritis on the Health-Related Quality of Life Among Individuals at the University of Central Florida

Ryan E. Garwood
University of Central Florida

THE IMPACT OF ARTHRITIS ON THE HEALTH-RELATED QUALITY OF LIFE AMONG INDIVIDUALS AT THE UNIVERSITY OF CENTRAL FLORIDA

by

RYAN E. GARWOOD

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Abstract

This purpose of the study is to examine the difference in the health-related quality of life (HR-QOL) between individuals who suffer from physician-diagnosed arthritis compared with individuals who do not suffer from physician-diagnosed arthritis in a population of university students, faculty, and staff. The study sampled from a population of students, faculty, and staff at the University of Central Florida. Through the implantation of a cross-sectional ecological design, differences between the two groups were measured with a survey that measures health-related quality of life, such as the 36-Item Short Form Health Survey (SF-36). The SF-36 questionnaire was distributed to subjects through a campus-wide email system and was administered through Qualtrics, an online survey program. Literature suggests lower SF-36 scores for individuals suffering from arthritis, but is lacking in investigating the effect of arthritis on college-aged students, particularly within the 18-24 age group. The study aims to close this gap in the literature. SPSS software was used to analyze results through tests of association, like ANOVA, which measured differences in the SF-36 scores of subjects with physician-diagnosed arthritis and subjects without physician-diagnosed arthritis. Results showed a significant difference in the HR-QOL scores between individuals with arthritis and individuals without arthritis, as well as age, gender, ethnicity, and the presence of joint pain.

Keywords: health-related quality of life; college-aged students; arthritis; SF-36

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Table of Contents

Background 1
Introduction 1
Literature Review 4
Methodology 10
Study Design 10
Sampling 10
Inclusionary and Exclusionary Criteria 10
Instrumentation 11
Hypotheses 13
Ethical Considerations 14
Results 16
Statistical Analysis 20
Discussion 28
Clinical Implications and Future Research 38
Limitations 42
Sampling 42
Use of Self-Reported Data 42
Appendix A: Screener Survey 44
Appendix B: 36-Item Short Form Survey Instrument (SF-36) 47
36-Item Short Form Survey Instrument (SF-36) 48
References Cited 54

List of Tables and Figures

Figure 1 (Scales and Constructs of the SF-36) 12
Figure 2 (Study Participants with and without Arthritis) 19
Table 1 (Prevalence of Self-Reported Physician-Diagnosed Arthritis) 7
Table 2 (Demographic Data for Study Participants) 17
Table 3 (Demographic Data for Participants with Arthritis) 20
Table 4 (ANOVA between PCS scores and the age variable for the study population) 24
Table 5 (ANOVA between PCS scores and the gender variable for the study population) 24
Table 6 (ANOVA between PCS scores and the ethnicity variable for the study population) 24
Table 7 (ANOVA between PCS scores and the joint pain variable for the study population) 24
Table 8 (ANOVA between PCS scores and the physician-diagnosed arthritis variable for the study population) 25

Background

Introduction

Arthritis is a general term for any of the more than 100 pathologic conditions affecting the joints and surrounding tissues that cause symptoms such as pain, stiffness, and inflammation (Arthritis in General, 2016). Two of the most common types of arthritis are osteoarthritis, a progressive, non-inflammatory joint disorder resulting in progressive loss of articular cartilage more prevalent in older adults, and rheumatoid arthritis, an autoimmune disease, systematic in nature, causing widespread joint inflammation (Copstead & Banasik, 2013).

Osteoarthritis is a noninflammatory joint disorder characterized by progressive damage to diarthrodial joints most prevalent in adults over the age of 70 (Copstead & Banasik, 2013). The etiology of osteoarthritis is a combination of lifestyle factors, such as obesity or long-term insult to the joints affected and genetic factors, such as congenital disorders causing abnormal joint movement (Copstead & Banasik, 2013). The disease results in the development of several pathologic changes, starting with the breakdown of hyaline cartilage at the surface of bones, which leads to the structural deterioration of joints through the growth of osteophytes and thickening of subchondral bone (Loeser, Goldring, Scanzello & Goldring, 2012). These manifestations, in addition to damaging effects in the surrounding tissue, are responsible for causing pain, discomfort, and reduced range of motion in those who are affected (Loeser et al., 2012).

Since osteoarthritis is degenerative and progresses over time, the primary goal of treatment is to reduce pain and maintain normal range of motion (Michael, Schlüter-Brust &

Eysel, 2010). This is accomplished primarily through physiotherapy, orthopedic aids, pharmacotherapy, and in severe cases, surgery (Michael et al., 2010). In a randomized controlled trial of 43 adults diagnosed with osteoarthritis, a regime of manual therapy proved to be significantly beneficial in decreasing the amount of pain and improving physical mobility for patients (Pollard, Ward, Hoskins & Hardy, 2008). Additionally, the administration of anti-inflammatory medications such as non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids, and COX-inhibitors are also proven (Michael et al., 2010). The anti-inflammatory mechanisms of these drugs alleviate the pain associated with joint damage and allow patients to function at a higher level, although each class of drugs has considerable side effects of varying severity (Michael, et al., 2010) and (Ong, Lirk, Tan & Seymour, 2007).

Unlike osteoarthritis, which is progressive and degenerative in nature, rheumatoid arthritis is an autoimmune disease, and its etiology is based on a wide variety of factors, with genetic predisposition playing a major role (Choy, 2012). More specifically, certain alleles of the HLA-DRB1 gene have been associated with the development of RA in patients diagnosed with the disease (Lechler & Warrens, 2000). The disease is characterized by the activation of immune cells (B cells and T cells) via an antigen trigger, which allows B cells to recruit additional immune cells, eventually activating the complement system and the production of cytokines, thus causing widespread inflammation throughout the body (Choy, 2012). Due to the autoimmune nature of rheumatoid arthritis, it is a systemic disease that can cause damage almost anywhere in the body, including, but not limited to the joints, the heart, the lungs, and the eyes (Choy, 2012).

Due to the autoimmune nature of rheumatoid arthritis, the primary treatment of the disease is to slow the progression of damage in order to prevent permanent, debilitating effects associated with untreated RA. This is accomplished through the use of disease-modifying antirheumatic drugs (DMARDs), such as methotrexate, and biologic agents, such as tumor necrosis factor (TNF) inhibitors. Per recommendations from both the European League against Rheumatism (EULAR) and the American College of Rheumatology (ACR), the use of disease-modifying antirheumatic drugs (DMARDs), such as methotrexate and TNF-inhibitors, such as adalimumab, etanercept, and infliximab, are particularly effective at preventing the pathologic manifestations of RA that are associated with long-term damage (Smolen et al., 2013; Singh et al., 2016).

Reducing the symptoms associated with widespread inflammation in order to maintain a normal lifestyle is also a major goal of RA treatment. Whereas DMARDs and TNF-inhibitors affect the pathophysiology processes of RA, medications such as aspirin and non-steroidal anti-inflammatory drugs (NSAIDs) are aimed at reducing inflammation and pain treat the symptoms of RA for a more immediate effect, albeit with varied levels of success (Conaghan, 2012). For most, if not all, types of arthritis, the chief complaint of patients tends to be high levels of pain, which subsequently lead to decreased levels of physical functioning (Pollard, Choy & Scott, 2005). Additionally, arthritis is classified as a chronic disease, and per the World Health Organization (WHO), chronic diseases, such as osteoarthritis and rheumatoid arthritis, tend to leave patients with some level of impairment, disability, and handicap (Pollard et al., 2005).

Literature Review

One way to quantify the extent of arthritis on an individual's health is by measuring health-related quality of life, or HR-QOL (Sajid, Tonsi & Baig, 2008). An individual's HR-QOL is commonly measured through a validated, self-reported survey, such as the 36-Item Short Form Health Survey (SF-36), which can be used for a wide variety of conditions to assess general health (Pollard et al., 2005), or the Health Assessment Questionnaire (HAQ), which is similar in nature, among many others (Hurst, Kind, Ruta, Hunter & Stubbings, 1997). Each of these surveys differ slightly in the variables measured, but all have the common goal of assessing the effects of chronic disease on one's overall well-being, or HR-QOL. Additionally, since each HR-QOL survey assesses different aspects of health, it can be difficult to compare studies based solely on data, meaning all survey results used to draw conclusions in research must be completely understood before being used as the basis for future studies (Hurst et al., 1997).

The use of surveys to measure HR-QOL allows researchers to quantify how a disease is affecting an individual in several categories, such as level of pain, ability to function physically, overall mental health, etc. (Hurst et al., 1997). Based on previous studies, there is considerable evidence that individuals diagnosed with arthritis have significant differences in HR-QOL scores.

Most studies in the literature focus on the impacts of either OA or RA on subjects' HR-QOL, but a cross-sectional study by the Australian researchers Hunter and Riordan utilized a generalized questionnaire to determine the effect of many different types of arthritis, including OA and RA, on HR-QOL (Hunter & Riordan, 2014). The study found that patients with arthritis scored considerably lower on the EQ-5D, which is a European-based HR-QOL scoring system,

than those in the healthy population (Hunter & Riordan, 2014). In fact, arthritis patients measured in the study scored lower on this HR-QOL scale than patients in comparable studies with diseases such as breast cancer, type II diabetes, anxiety disorders, and severe cardiac disease (Hunter & Riordan, 2014), suggesting that arthritis has a considerably negative impact on the lives of those affected.

The Hunter and Riordan study was also one of the few in the literature to have sufficient data for patients in all age groups, and suggested several important points. For one, patients in the 18-24 age group showed a much higher level of concern (24%) in regard to the impact of arthritis on the "social aspects of life," compared to the entire sample average, which was only 5% (Hunter and Riordan, 2014). This may be a significant finding about arthritis in younger, college-aged populations, but further data regarding the impact of arthritis on younger patients, particularly those within the 18-24 age group, is sparse, and does not exist in large quantities.

In a cohort study investigating chronic hip and knee complaints, there was a significant decrease in the HRQL in patients with chronic complaints in the hip and knee when compared to patients without these complaints (van der Waal, Terwee, van der Windt, Bouter & Dekker, 2005). In fact, patients with chronic hip and knee complaints were found to have HRQL scores (in the category of physical functioning) of up to 2.9 standard deviations below those without the same complaints, demonstrating that symptoms similar in nature to osteoarthritis can be detrimental to the quality of life (van der Waal et al., 2005). These findings are bolstered by another study, which found significant associations between those with lower limb osteoarthritis and decreased HR-QOL, although in this particular study, the negative impact of OA was more

prevalent in females, which follows common patterns associated with arthritis (Rosemann et al., 2007).

Similar relationships exist in those who suffer from rheumatoid arthritis, with the systemic nature of RA causing significantly decreased HRQL in many studies, due to pain, inflammation, and additional, non joint-related symptoms (Choy, 2012).

In an long-term cohort study of RA patients, increasing age was correlated with increased erythrocyte sedimentation rate (ESR), which is both a blood test measuring inflammation in the body and a biomarker in the diagnosis of RA (Radovits, Fransen, van Riel & Laan 2008). While this alone is not enough to make a determination about the impact of RA over long periods of time, it does indicate that levels of inflammation increase in older adults with RA, suggesting the severity of RA could be higher in older adults in comparison to younger adults. Additionally, it could suggest the impact of RA on younger adults is associated with a less severe course of RA and less comorbidities, meaning higher levels of HR-QOL, but these inferences cannot be proven from the data presented in this study (Radovits et al., 2008).

There is also evidence to suggest that patients with RA score lower on both the Physical Functioning (PCS) and Mental Functioning (MCS) scales in the SF-36 than patients with other inflammatory arthritis conditions, such as ankylosing spondylitis and psoriatic arthritis (Salaffi, Carotti, Gasparini, Intorcia & Grassi, 2009).

One major limitation with many studies investigating the HR-QOL in individuals with both osteoarthritis and rheumatoid arthritis is the age of subjects included in such studies. Many studies investigating arthritis and HR-QOL have samples with the average age of subjects well

into their 50s. Below is a chart outlining the prevalence of self-reported physician-diagnosed arthritis in the U.S. population (Helmick et al., 2008).

Table 1: Prevalence of Self-Reported Physician-Diagnosed Arthritis

Age Group	Total Population	Doctor-Diagnosed Arthritis
18-44	110,318,000	8,700,000 **(7.89%)**
45-64	70,019,000	20,500,000 **(29.3%)**
65+	34,435,000	17,200,000 **(49.9%)**
Total	214,772,000	46,400,000 **(21.6%)**

Per this study by Helmick, et al., the prevalence of arthritis is higher in older populations versus younger populations, thus accounting for the majority of arthritis studies sampling primarily older individuals. But, in studies that do include younger individuals, evident differences in the effects of arthritis have been observed, suggesting that the disease affects younger adults differently than older adults. Given the limited amount of data about younger people, particularly those of college age (18-24), there is a lack of knowledge about the specific effects of arthritis on individuals of this age group in regard to HR-QOL, and more research must be done.

With rheumatoid arthritis, many previous studies have shown a correlation between the presence of disease and lowered mental health scores on HR-QOL surveys, such as the SF-36. In a study done by Salaffi et al., the mean SF-36 MCS (mental functioning) score for subjects aged 18-34 in the control group was 47.7 +/- 6.9, whereas the mean SF-36 MCS score for those in the RA group was 40.6 +/- 9.9, showing a significant decrease in the mental health of RA patients compared to subjects in the control group (Salaffi, et al., 2009).

There are many other studies in the literature suggesting associations between mental health disorders, such as depression and anxiety, and arthritis. One study with data based on self-reported answers estimated that about 30% of arthritis patients suffer from anxiety and 17.5% suffer from depression, both of which are significantly higher than the prevalence of those in the general population (Murphy, Sacks, Brady, Hootman & Chapman, 2012). In another study, it was found that major depression is prevalent in patients with rheumatoid arthritis at a rate of approximately 16.8%, which is much higher than the rate in the general population (4.1%) (Matcham, Rayner, Steer & Hotopf, 2013; Waraich, Goldner, Somers & Hsu, 2004).

This, combined with the fact that mental health disorders, such as anxiety and depression are becoming increasingly prevalent on college campuses, raises questions about the impacts of arthritis on college students (Beiter et al., 2015; Ibrahim, Kelly, Adams & Glazebrook, 2013).

The lack of data for younger arthritis patients, particularly those within the 18-24 age group, is responsible for the knowledge gap with respect to arthritis and HR-QOL. A study investigating the relationship between young adults with arthritis and employment showed that there are some differences between employment statistics of subjects with arthritis versus subjects without arthritis, but many of the findings were not statistically significant (Jetha, 2015). In fact, one of the main findings from the Jetha study was the determination that there were not enough studies on impacts of arthritis on young adults to make significant inferences (Jetha, 2015).

Without sufficient literature on this relationship, future studies in this area must be of the highest importance. This study focused on the difference in HR-QOL of subjects with arthritis and subjects without arthritis on a university campus, therefore attempting to determine if there

is a significant difference in the HR-QOL scores. The researchers in this study attempted to find statistically significant data about the impact of arthritis on subjects at a university campus, thus adding knowledge to an area where there is a serious gap.

Methodology

Study Design

The study design is a cross-sectional ecological study. The aim of the research was to determine if there is a statistically significant difference in the health-related quality of life (HR-QOL) of those with arthritis as compared to those without arthritis. This established two groups of subjects: subjects with a self-reported physician-diagnosed arthritis condition and subjects without a self-reported physician-diagnosed arthritis condition. The research aimed to answer two questions: Is there a significantly significant difference in the health-related quality of life (HR-QOL) of those with self-reported doctor-diagnosed arthritis when compared to those without self-reported doctor-diagnosed arthritis? And, among which demographic group is the prevalence of arthritis the highest?

Sampling

The University of Central Florida currently has 63,016 students and a total of 11,642 employees and faculty. In order to make sampling easier, the survey will be sent out to all students, employees, and faculty within the College of Health and Public Affairs through a college-wide email system. Those who complete the informed consent and meet inclusion/exclusion criteria will be permitted to take the full survey and to participate in the study. Completion, and submission, of the survey is all that is required of study subjects.

Inclusionary and Exclusionary Criteria

Individuals who are at least 18 years of age and are a student, faculty member, or staff member at the University of Central Florida were included in the study. The survey asked three questions about subjects' medical history in reference to arthritis, but these questions were not

for inclusionary and exclusionary criteria, but rather for the purpose of creating two groups of subjects on the basis of self-reported physician-diagnosed arthritis.

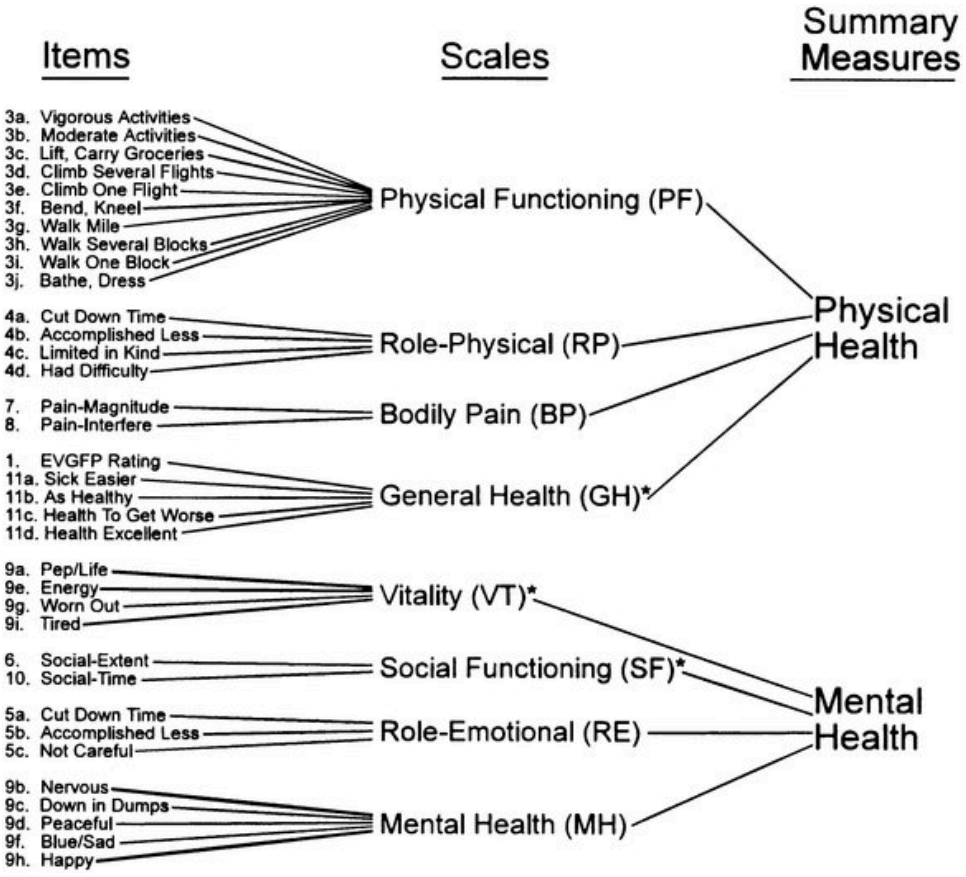
Instrumentation

Participants were initially given a nine question screening survey. Screening questions have been developed by the researcher and were used for the sole purpose of determining eligibility, demographic information, and diagnostic history with respect to arthritis. The last three questions of the screening survey asked subjects about any joint pain within the last few months, if they have ever been diagnosed with arthritis by a doctor, and if they have been diagnosed with arthritis, with which type. These questions were derived from the Adult Conditions category of the 2015 National Health Interview Survey (NHIS) (2015 NHIS Questionnaire – Sample Adult (Adult Identification), 2016).

If subjects were deemed eligible to participate, they were then given the 36-Item Short Form Survey (SF-36), which is a professionally developed and validated quality of life survey. The SF-36 measures an individual's quality of life through the following scales: physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain, and general health (Salaffi, et al., 2009). Additionally, the SF-36 allows researchers to calculate summary component scores for both physical functioning (PCS) and mental functioning (MCS) (Salaffi, et al., 2009). The SF-36 has been validated in previous studies for measuring the HR-QOL in patients with both osteoarthritis and rheumatoid arthritis and has proven to be a "psychometrically robust" instrument (ten Klooster, et al., 2013) and (Kosinski, Keller, Hatoum, Kong & Ware, 1999).

The SF-36 was the primary instrument of this study and was used to quantify the differences between arthritis patients and non-arthritis patients in the study. Each of the questionnaire's 36 questions relate to one of the eight scales and the two summary component scores (PCS and MCS) and these values will be used for comparisons between groups. For each of the eight scales, the highest score for each question is 100 and the lowest score is 0, meaning a scale score of 100 would be the "highest" level for quality of life and a scale score of 0 would be the "lowest" quality of life scale (36-Item Short Form Survey (SF-36) Scoring Instructions). Therefore, higher PCS and MCS scores on the SF-36 would indicate a "higher" level for quality of life, and lower PCS and MCS scores on the SF-36 would indicate a "lower" level for quality of life.

Figure 1: Scales and Constructs of the SF-36



Qualtrics is a web-based survey tool used by researchers at the University of Central Florida and was used to build the questionnaire and allowed for easy distribution of the questionnaire to UCF students, faculty, and staff through the campus-wide email system.

SPSS software was used to analyze data collected from questionnaire responses and to perform several statistical tests on the data in order to determine significance. Means and standard deviations for the two component summary scores (PCS and MCS scores) the SF-36 measures were calculated for both groups and compared to each other through ANOVA. ANOVA was also performed to determine differences between demographic groups studied as well.

Hypotheses

- Null Hypothesis (H_o): There will be no association between the PCS and MCS scores on the SF-36 questionnaire between subjects with doctor-diagnosed arthritis and subjects without doctor-diagnosed arthritis.
- Experimental Hypothesis (H_1): PCS and MCS scores on the SF-36 questionnaire for subjects with doctor-diagnosed arthritis will be significantly lower than the PCS and MCS scores for subjects without doctor-diagnosed arthritis.
- Alternative Hypotheses:
    - H_2: PCS and MCS scores on the SF-36 questionnaire for subjects who report having doctor-diagnosed rheumatoid arthritis will be significantly lower than subjects who report having any other type of doctor-diagnosed arthritis.

- H_3: PCS and MCS scores on the SF-36 questionnaire for faculty and staff who report having doctor-diagnosed arthritis will be significantly lower than students who report having doctor-diagnosed arthritis.
- H_4: The Mental Functioning Score (MCS) for all subjects reporting doctor-diagnosed arthritis will be significantly lower than the MCS for all subjects who do not report having doctor-diagnosed arthritis.
- H_5: The Physical Functioning Score (PCS) for all subjects reporting doctor-diagnosed arthritis will be significantly lower than the PCS for all subjects who do not report having doctor-diagnosed arthritis.

Ethical Considerations

The study uses human subjects and has gone through the appropriate ethical review with the Institutional Review Board (IRB) at the University of Central Florida. The study will respect the autonomy of all subjects and will uphold the ethical principles of beneficence and nonmaleficence. Since the questionnaire was administered to all subjects through a personal computer, the risk of physical harm is very small and the risk of mental or emotional harm is also minimal. Nevertheless, anyone participating in the questionnaire had the ability to withdraw at any time, and were not part of the study until they answered all the questions and electronically submitted the survey through the Qualtrics system.

Per IRB protocol, both the privacy and confidentiality of subjects were protected, and this will not have any negative effects on the collection or analysis of data for the purposes of the study. No identifying information was asked of subjects when completing the questionnaire, and the only personal questions being asked will pertain to age, demographics, status at the

University of Central Florida, and several questions about each subjects' medical history as it pertains to arthritis. Additionally, all data collected from the questionnaires was stored on password-protected computers in the possession of the researchers.

Results

Review of Study Participants

A total of 333 participants submitted questionnaires through Qualtrics, and 35 of these responses were discarded because they were incomplete, so 298 responses were used for analysis of the study. Demographics-wise, the largest age group was the 18-22 group, with 46.6% (n = 139) respondents, followed by the 23-27 group, with 19.1% (n = 57), making the majority of study participants between the ages of 18 and 27 (Table 2). Females outnumbered males by a large margin, 86.1% (n = 254) and 13.6% (n = 40), respectively (Table 2). In terms of ethnicity, white participants were the majority, with 61.4% (n = 183), followed by Hispanics/Latinos at 16.4% (n = 49) (Table 2). In regard to status at UCF, the majority of respondents were undergraduate students, with 67.4% (n = 201), followed by graduate students with 20.8% (n = 62) (Table 2). Combined, faculty and staff made up 11.7% (n = 35) of the study population (Table 2). Among the undergraduate students, juniors and seniors were a large majority, with 81.1% (n = 163) of the undergraduate sample (Table 2). Finally, of the 298 study participants, 54.5% (n = 158) reported pain, aching, or stiffness in or around a joint during the past few months (Table 2).

Table 2: Demographic Data for Study Participants

	n	%	Mean PCS	Mean MCS
AGE				
18-22	139	46.6%	81.25	65.54
23-27	57	19.1%	81.00	64.27
28-32	24	8.1%	74.87	66.54
33-39	27	9.1%	74.70	63.70
40-49	24	8.1%	72.45	68.37
50-59	18	6.0%	66.84	71.08
60+	9	3.0%	68.33	71.78
GENDER				
Male	40	13.6%	78.08	68.71
Female	254	86.1%	78.32	65.53
ETHNICITY				
Asian	14	4.7%	71.12	60.90
Black or African American	34	11.4%	83.93	72.11
Native Hawaiian or Pacific Islander	1	0.3%	20.63	55.13
White	183	61.4%	78.33	65.68
Hispanic or Latino	49	16.4%	77.33	65.31
Biracial or Multiracial	16	5.4%	74.57	65.13
STATUS				
Faculty	18	6.0%	80.45	74.36
Staff	17	5.7%	69.74	69.64
Graduate/Professional Student	62	20.8%	79.88	65.11
Undergraduate Student	201	67.4%	78.09	65.17
CLASSIFICATION (among undergraduate students)				
Freshman	13	6.5%	79.95	67.83
Sophomore	25	12.4%	76.78	58.95
Junior	78	38.8%	77.40	65.01
Senior	85	42.3%	78.82	66.72
JOINT STIFFNESS				
Yes	158	54.5%	73.39	65.71
No	132	45.5%	84.28	67.35
PHYSICIAN-DIAGNOSED ARTHRITIS				
Yes	50	16.8%	66.50	66.96
No	244	81.9%	80.91	65.82
Don't Know	4	1.3%	53.44	62.63
TYPE OF ARTHRITIS (among physician-diagnosed arthritis)				
Rheumatoid Arthritis	6	12.0%	67.60	63.59
Osteoarthrits	27	54.0%	65.97	71.38
Other	17	34.0%	66.95	61.13

Of the 298 study participants, 16.8% (n = 50) reported having physician-diagnosed arthritis (Figure 2). When looking at age as a variable, the age groups with the most participants reporting arthritis were the 18-22 age group and the 50-59 age group, with 24.0% (n = 12) of the total arthritis participants found in each. In terms of gender, 82.0% (n = 41) of the participants reporting arthritis were female, and 16.0% (n = 8) were male. Of the six different ethnicities available in the survey, 74.0% (n = 37) were white and 18.0% (n = 9) were African-American or black. With UCF Status as a variable, 44.0% (n = 22) of participants reporting arthritis were undergraduate students, 22.0% (n = 11) were graduate or professional students, 20.0% (n = 10) were staff, and 14.0% (n = 7) were faculty members. Of the undergraduate students reporting arthritis, there were ten seniors, eight juniors, two sophomores, and two freshmen.

Of the participants reporting arthritis, 96% (n = 47) reported suffering from joint pain, aching, or stiffness over the past few months.

Of the 50 reporting physician-diagnosed arthritis, 12.0% (n = 6) reported rheumatoid arthritis, 54% (n = 27) reported osteoarthritis, and 34% (n = 17) reported "other" and had the option of directly inputting their diagnosis in a text box. Of the 17 reporting "other", 16 provided further explanations (four were unable to recall the type, five reported "juvenile", and the remaining seven were inconclusive as to which type).

Figure 2: Study Participants with and without Arthritis

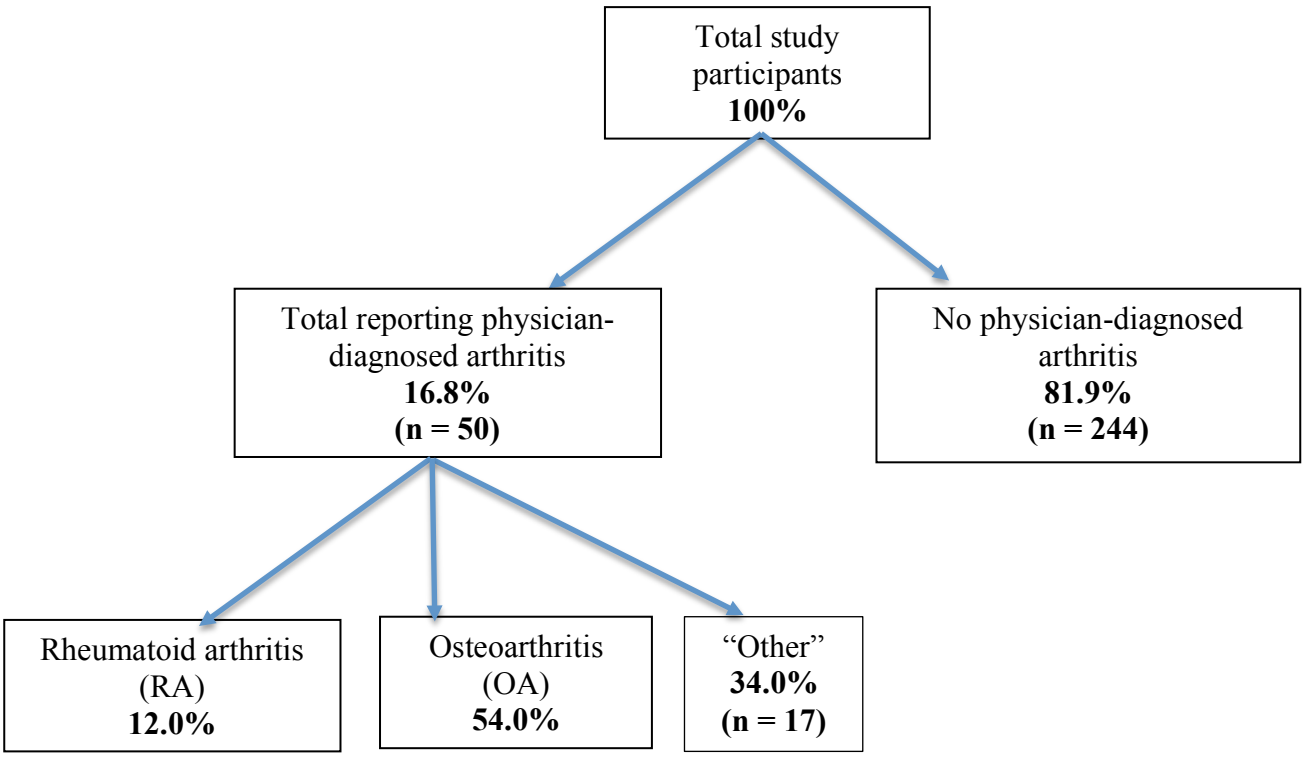


Table 3: Demographic Data for Participants with Arthritis

	n	%[1]	% of total demo pop.[2]	Mean PCS	Mean MCS
AGE					
18-22	12	24.0%	8.6%	70.26	61.81
23-27	3	6.0%	5.3%	55.42	46.00
28-32	2	4.0%	8.3%	58.13	67.60
33-39	6	12.0%	22.2%	57.81	61.57
40-49	9	18.0%	37.5%	64.03	64.54
50-59	12	24.0%	66.7%	69.69	74.36
60+	6	12.0%	66.7%	73.33	81.72
GENDER					
Male	8	16.0%	20.0%	66.56	65.26
Female	41	82.0%	16.1%	66.72	66.47
ETHNICITY					
Asian	0	0.0%	0.0%	N/A	N/A
Black or African-American	9	18.0%	26.5%	75.76	70.33
Native Hawaiian or Pacific Islander	0	0.0%	0.0%	N/A	N/A
White	37	74.0%	20.2%	64.76	66.37
Hispanic or Latino	3	6.0%	6.1%	52.71	56.81
Biracial/Multiracial	1	2.0%	6.3%	88.75	88.75
STATUS					
Faculty	7	14.0%	38.9%	79.91	78.21
Staff	10	20.0%	58.8%	68.56	74.34
Graduate/Professional Student	11	22.0%	17.7%	68.09	63.90
Undergraduate Student	22	44.0%	10.9%	60.51	61.55
CLASSIFICATION					
Freshman	2	4.0%	15.4%	69.06	76.52
Sophomore	2	4.0%	8.0%	77.81	44.60
Junior	8	16.0%	10.3%	38.90	54.56
Senior	10	20.0%	11.8%	72.63	67.54

Statistical Analysis

Upon completion of data collection, data was exported from Qualtrics into the Statistical Package for the Social Sciences (SPSS). Variable names were assigned to each of the nine questions in the screener survey (Appendix I) and proper scoring values were assigned to each of

[1] Proportion of total arthritis population
[2] Proportion of arthritis participants per demographic group

the 36 questions in the SF-36 using the "36-Item Short Form Survey (SF-36) Scoring Instructions." Scores for each of the eight categories (physical functioning, general health, bodily pain, role physical, vitality, social functioning, role emotional, and mental functioning) were calculated and used to calculate the PCS and MCS scores that will be used for the majority of analysis.

Initially, frequencies were calculated for each of the demographic groups using the descriptive statistics tool in SPSS. Means and standard deviations for both PCS and MCS scores were then calculated for each demographic group.

One-way Analysis of Variance (ANOVA) tests were used to test for associations between the dependent variables (PCS and MCS) and each of the demographic and medical history questions found in the screener survey (Appendix I). The first set of ANOVAs were computed to test for significant differences between mean PCS scores and age, gender, ethnicity, UCF status, UCF classification, joint pain, presence of physician-diagnosed arthritis in the study population (n = 298) and between mean MCS scores and age, gender, ethnicity, UCF status, UCF classification, joint pain, presence of physician-diagnosed arthritis in the study population (n = 298). For each of these tests, a 95% confidence interval was used. Below are the results of each ANOVA ran:

1. A one-way ANOVA was computed to compare the mean PCS scores of study participants in each of the seven age groups. A significant difference was found between each of the age groups ($p = 0.027$) (Figure 15).

2. A one-way ANOVA was computed to compare the mean MCS scores of study participants in each of the seven age groups, and the ANOVA was not significant ($p > 0.05$).
3. A one-way ANOVA was computed to compare the mean PCS scores of male and female study participants. A significant difference was found between males and females ($p = 0.025$) (Figure 16).
4. A one-way ANOVA was computed to compare the mean MCS scores of male and female study participants, and the ANOVA was not significant ($p > 0.05$).
5. A one-way ANOVA was computed to compare the mean PCS scores of study participants in each of the six ethnicities. A significant difference was found between the ethnicities ($p = 0.034$) (Figure 17).
6. A one-way ANOVA was computed to compare the mean MCS scores of study participants in each of the six ethnicities, and the ANOVA was not significant ($p > 0.05$).
7. A one-way ANOVA was computed to compare the mean PCS scores of study participants in each of the four UCF statuses, and the ANOVA was not significant ($p > 0.05$).
8. A one-way ANOVA was computed to compare the mean MCS scores of study participants in each of the four UCF statuses, and the ANOVA was not significant ($p > 0.05$).

9. A one-way ANOVA was computed to compare the mean PCS scores of study participants in each of the four UCF classifications, and the ANOVA was not significant ($p > 0.05$).
10. A one-way ANOVA was computed to compare the mean MCS scores of study participants in each of the four UCF classifications, and the ANOVA was not significant ($p > 0.05$).
11. A one-way ANOVA was computed to compare the mean PCS scores of study participants either reporting joint pain or not reporting joint pain. A significant difference was found among participants reporting joint pain and participants not reporting joint pain ($p < 0.000$) (Figure 18).
12. A one-way ANOVA was computed to compare the mean MCS scores of study participants either reporting joint pain or not reporting joint pain, and the ANOVA was not significant ($p > 0.05$).
13. A one-way ANOVA was computed to compare the mean PCS scores of study participants either reporting physician-diagnosed arthritis or not reporting physician-diagnosed arthritis. A significant difference was found among participants reporting arthritis and participants not reporting arthritis ($p < 0.000$) (Figure 19).
14. A one-way ANOVA was computed to compare the mean MCS scores of study participants either reporting physician-diagnosed arthritis or not reporting physician-diagnosed arthritis, and the ANOVA was not significant ($p > 0.05$).

Table 4: ANOVA between PCS scores and the age variable for the study population

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PCS	Between Groups	6331.566	6	1055.261	2.415	.027
	Within Groups	127132.105	291	436.880		
	Total	133463.671	297			

Table 5: ANOVA between PCS scores and the gender variable for the study population

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PCS	Between Groups	3315.597	2	1657.798	3.748	.025
	Within Groups	129164.533	292	442.344		
	Total	132480.130	294			

Table 6: ANOVA between PCS scores and the ethnicity variable among the study population

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PCS	Between Groups	5383.168	5	1076.634	2.449	.034
	Within Groups	127923.779	291	439.601		
	Total	133306.947	296			

Table 7: ANOVA between PCS scores and the joint pain variable among the study population

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PCS	Between Groups	8528.021	1	8528.021	20.717	.000
	Within Groups	118550.816	288	411.635		
	Total	127078.838	289			

Table 8: ANOVA between PCS scores and the physician-diagnosed arthritis variable for the study population

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PCS	Between Groups	11093.488	2	5546.744	13.372	.000
	Within Groups	122370.183	295	414.814		
	Total	133463.671	297			

The second set of ANOVAs were run to test for differences between mean PCS scores and age, gender, ethnicity, UCF status, UCF classification, joint pain, and type of arthritis in the population of participants with physician-diagnosed arthritis (n = 50) and between mean MCS scores and age, gender, ethnicity, UCF status, UCF classification, joint pain, and type of arthritis in the population of participants with physician-diagnosed arthritis (n = 50).

1. A one-way ANOVA was computed to compare the mean PCS scores of study participants with physician-diagnosed arthritis in each of the seven age groups, and the ANOVA was not significant ($p > 0.05$).
2. A one-way ANOVA was computed to compare the mean MCS scores of study participants with physician-diagnosed arthritis in each of the seven age groups, and the ANOVA was not significant ($p > 0.05$).
3. A one-way ANOVA was computed to compare the mean PCS scores for male and female study participants with physician-diagnosed arthritis, and the ANOVA was not significant ($p > 0.05$).

4. A one-way ANOVA was computed to compare the mean MCS scores for male and female study participants with physician-diagnosed arthritis, and the ANOVA was not significant ($p > 0.05$).
5. A one-way ANOVA was computed to compare the mean PCS scores of study participants with physician-diagnosed arthritis in each of the six ethnicities, and the ANOVA was not significant ($p > 0.05$).
6. A one-way ANOVA was computed to compare the mean MCS scores of study participants with physician-diagnosed arthritis in each of the six ethnicities, and the ANOVA was not significant ($p > 0.05$).
7. A one-way ANOVA was computed to compare the mean PCS scores of study participants with physician-diagnosed arthritis in each of the four UCF statuses, and the ANOVA was not significant ($p > 0.05$).
8. A one-way ANOVA was computed to compare the mean MCS scores of study participants with physician-diagnosed arthritis in each of the four UCF statuses, and the ANOVA was not significant ($p > 0.05$).
9. A one-way ANOVA was computed to compare the mean PCS scores of study participants with physician-diagnosed arthritis in each of the four UCF classifications. A significant difference was found among UCF classifications in the sample of participants reporting physician-diagnosed arthritis ($p = 0.021$) (Figure 20).

10. A one-way ANOVA was computed to compare the mean MCS scores of study participants with physician-diagnosed arthritis in each of the four UCF classifications, and the ANOVA was not significant ($p > 0.05$).
11. A one-way ANOVA was computed to compare the mean PCS scores of study participants with physician-diagnosed arthritis in each of the three categories of arthritis (rheumatoid arthritis, osteoarthritis, and "other"), and the ANOVA was not significant ($p > 0.05$).
12. A one-way ANOVA was computed to compare the mean MCS scores of study participants with physician-diagnosed arthritis in each of the three categories of arthritis (rheumatoid arthritis, osteoarthritis, and "other"), and the ANOVA was not significant ($p > 0.05$).

Discussion

The main focus of this study, and the basis for the null hypothesis, was whether a difference exists in the health-related quality of life for individuals with self-reported, physician-diagnosed arthritis compared to the health-related quality of life for individuals without arthritis.

The PCS scores of participants reporting physician-diagnosed arthritis (66.50) were significantly lower than the PCS scores of participants without arthritis (80.91). Based on previous studies relating arthritis and HR-QOL, this result was expected and closely aligns with data from studies found in the literature (van der Waal et al., 2005; Rosemann et al., 2007; Choy, 2012; Salaffi et al., 2009). Generally speaking, the symptoms of diffuse joint pain and inflammation seen in both rheumatoid arthritis and osteoarthritis would lead to deficits in physical functioning, which is one of the constructs the PCS score encompasses. For the most part, these patterns held across the different demographic groups in the sample population.

The first alternative hypothesis (H_2), which predicted that the PCS and MCS scores of participants with rheumatoid arthritis would be significantly lower than the scores of participants with other types of arthritis, was rejected through the computation of ANOVA. For one, only six study participants reported rheumatoid arthritis. With the small amount of data available to calculate significance in regard to H_2, this result is not conclusive to the overall question of a difference in quality of life for rheumatoid arthritis patients as compared to patients with other types of arthritis. Studies found in the literature are split on whether or not patients with RA have lower health-related quality of life than patients with other types of arthritis. One study examining the differences in health-related quality of life of patients with many different chronic diseases found RA patients scored lower than osteoarthritis patients in areas of general health

and bodily pain, using the SF-36 questionnaire (Murillo, Almagro, Campos-Gonzalez & Cardiel, 2015) while another study found no significant difference in the health-related quality of life between subjects with various musculoskeletal diseases, although pain and diminished health-related quality of life were prevalent in both RA and OA (Picavet & Hoeymans, 2003). Given the similarity in symptoms with both RA and OA, the question of which type leads to lower health-related quality of life scores is not easy to answer and may differ depending on the instrument used to measure HR-QOL and the sample used. Future studies with a larger, and more representative, population of individuals with RA should be done to definitively answer this question.

The second alternative hypothesis (H_3), which predicted that the PCS and MCS scores of faculty and staff with arthritis would be significantly lower than the scores of students with arthritis, was rejected through the computation of ANOVA. While some studies reported in the literature review suggested a potential link between arthritis and lower mental health-related quality of life scores, the data in this study showed no such relationship. In fact, ANOVA was calculated for all participants in each demographic group and then for all arthritis participants in each demographic group, and there were no ANOVAs showing a p-value of < 0.05, demonstrating the lack of a significant relationship between arthritis and decreased MCS scores.

In developing the hypotheses for this study, a relationship between MCS scores and arthritis was of particular interest because of the growing awareness of mental health in today's society and the growing amount of research showing the manifestation of certain mental illness during young adulthood.

For H_3, it was predicted that faculty and staff would likely have additional domestic responsibilities, such as taking care of children or running a household, in addition to their responsibilities as a faculty or staff member at the university. Every group in the status variable is different in the work and activities they are responsible for, but each has its own set of unique concerns that could cause stress and decreased mental functioning, so the lack of significance for MCS scores isn't a particularly surprising result.

As previously stated, the largest proportion of participants were in the youngest age group (18-22), and a majority of participants (65.7%) were under the age of 27, and based on sampling techniques utilized in this study, that was expected. In comparison to the total sample, higher proportions of older study participants reported arthritis when compared to younger study participants. This trend holds true in other studies found in the literature, such as the Helmick study (Helmick et al., 2008). While the Helmick study used only three age groups (and this study used seven) the trend between increasing age and increasing prevalence of arthritis is clearly evident in both studies.

Since rates of arthritis increased with age, it only makes sense that a negative correlation was found between mean PCS scores and age, with PCS scores decreasing with each increasing age group (except from 50-59 to 60+, where a slight increase was noted, possibly due to the smaller number of participants from these age groups). The results of this study would suggest that more participants with arthritis in the older age groups led to the decline in health-related quality of life, which may have been the case, although with ANOVA, directionality is not measured, only associations are, so this cannot be tested for given the conditions.

In the absence of chronic disease, younger people typically score higher on health-related quality of life surveys when compared to older people (Hopman, et al., 2000), so the introduction of participants with a chronic disease, like arthritis, could create more of a difference in health-related quality of life scores for participants in younger age groups since they would typically have a much higher baseline than those in older age groups would. Simply put, a chronic disease can create more of a discrepancy in the health-related quality of life for younger individuals with arthritis versus their counterparts without arthritis. When in their twenties, individuals are expected to be in the best physical shape of their lives and are not supposed to suffer from joint pain and loss of physical functioning, so a diagnosis of arthritis can greatly alter their way of life.

Additionally, the prevalence of comorbidities slightly increases each year between the ages of 20 and 70, with the largest increases occurring after the age of 50 (Davis, Chung & Juarez, 2011). The presence of such comorbidities is associated with decreases in physical functioning, decreases in quality of life, and increases in depression (Davis, et al., 2011). This provides additional support for the finding that decreasing health-related quality of life is associated with increasing age. While the symptoms of arthritis are serious at any age, their effects may be more noticeable among individuals at younger ages since they are less likely to suffer from additional chronic diseases.

Additionally, the rareness of arthritis among younger individuals adds another difference between younger and older individuals: shared experience among one's cohort. For older individuals, in this case 50 and over, prevalence statistics make it much more likely that an individual suffering from arthritis will know someone else in their "circle" who also has the disease, whereas the same prevalence statistics suggest a younger individual, in their 20s or 30s,

will be much less likely to know someone with the disease. Many times, studies about a chronic physical disease such as arthritis fail to examine the mental and emotional aspects of having a lifelong disease, especially among young people in college, who are already at a higher risk of mental illnesses such as anxiety and depression (Ibrahim, et al., 2013). While many previously conducted quality of life studies have not found a significant association between MCS scores in arthritis vs. non-arthritis participants, further work should be done to examine potential associations between declining mental health and prevalence of chronic diseases (Hopman, Harrison, Coo, Friedberg, Buchanan & VanDenKerkhof, 2009).

The fact that females had lower PCS scores than males contradicts the abundancy of research found in the literature; females generally score lower than males in studies measuring health-related quality of life (Hopman et al., 2000; Jenkinson, Stewart-Brown, Petersen & Paice, 1999;). This trend could be related to the higher risk of chronic autoimmune and inflammatory diseases in females (Hopman et al., 2000). Subsequently, this risk translates into higher rates of autoimmune diseases in females. Almost all studies reviewed during the a priori stage had more female subjects than male subjects, due to the higher risk of arthritis among females (Arthritis-Related Statistics). This does not indicate that females have better or worse symptoms than males do; rather it only demonstrates that more females suffer from arthritis than males. Reasons for this gender-based difference are not fully understood, but genetics are thought to play a role (O'Connor, 2006).

Additionally, arthritis was slightly more prevalent in males than females (16.1% of the females in the study population reported arthritis while 20% of the males reported arthritis), which again contradicts the findings of most other arthritis studies. Since there were many less

male participants (13.6%) than female participants (86.1%) in the whole study, the lack of male participants in the study was not representative of the entire UCF population and is the most probable reason for the increase. When there are large differences in the sample sizes of two demographic groups, small increases in the group with the smaller sample size result in larger changes in proportion. For instance, if one fewer female had reported arthritis, the prevalence would have decreased from 16.1% to 15.7%; if one fewer male had reported arthritis, the prevalence would have decreased from 20.0% to 17.5%.

The population sampled from, the College of Health and Public Affairs (COHPA), has 70.5% (N=7255) females and 29.5% (N=3040) males whereas within the general population, the two genders are relatively equal. Since the sample population had an even higher proportion of females than the population data from COHPA, the difference in prevalence data in this study and in studies from the literature can be attributed to the large gender gap.

This gender gap is also the most likely reason for significant difference between male and female PCS scores; the low proportion of males in the study skewed the data toward showing an association where one may not actually exist. With respect to gender, many previously conducted studies had samples more representative of the general population than this study did, so those results should be held with higher weight than the results obtained in this study.

The study's small and unrepresentative sample may have played a role in the association existing between mean PCS scores and ethnicity as well. It is important to note that among previous studies conducted, differences in arthritis based on ethnicity have not typically been found. One study comparing the severity of arthritis in Caucasian and African-American men showed no significant findings and concluded that there were no discernable differences in the

two groups (Mikuls et al., 2007). Similar to what was found with the gender variable, this study's small sample size may have contributed to the significance in among ethnicity groups when one may not exist for the entire target population.

Since this was a study focusing on the effects of arthritis in a university population, the question of differences in quality of life among the different status groups was an important factor to consider, but since there are no set demographic requirements for inclusion into a status group, differences between the groups would have to come from experiential differences related to their roles on campus, and not biologic ones, such as age, gender, or ethnicity.

Since significant associations were found between PCS scores in the age, gender, and ethnicity variables, it stands to reason that an association would not be found between the status variable, since an individual of any status could belong to up to 84 different combinations of the aforementioned three variables. The status variable erases any association found in age, gender, or ethnicity.

As for classification, the interesting finding of extremely decreased PCS scores among juniors stands out as a probable outlier. In trying to generalize this result to the target population, one must question whether the small sample size of undergraduates with arthritis (n = 22) led to a spurious correlation. While noting that junior year of college can be more demanding than sophomore year, it is hard to find an explanation for such a drastic decrease in PCS scores for undergraduate students one grade level apart. Moreover, the mean PCS score for seniors is 72.63, meaning this decrease is isolated only among participants with junior classification. The only plausible explanation for this is the age of the eight junior participants in the study who reported arthritis. Three of the eight were above the age of 40 and as previously

explained, increasing age was associated with decreasing PCS scores. Therefore, the significance found with the classification variable can be attributed to the specific sample of juniors with arthritis in our study and not a difference among juniors across all university populations.

Perhaps the most unexpected finding in this study was the large discrepancy found between participants reporting joint pain and participants reporting physician-diagnosed arthritis. There are many reasons for one to experience joint pain, including relatively benign ones such as sports injuries or normal wear and tear on the body, but arthritis is a leading cause of joint pain and great care should be taken in the diagnosis and treatment of it. Since this study was done through self-reporting, there is no scientific way to diagnose the cause of each participant's joint pain, but if the cause was an undiagnosed case of arthritis, the consequences could be serious.

Rheumatoid arthritis is a serious autoimmune disease that is systemic in nature, meaning it affects multiple organ systems at once (Copstead & Banasik, 2013). In RA, joint pain is caused by inflammation and destruction of joints (Copstead & Banasik, 2013). A Dutch study examining differences in long-term RA outcomes based on length between initial symptoms and start of disease-modifying anti-rheumatic drug (DMARD) treatment showed that earlier initiation of medication in the disease course led to better long-term outcomes, including less joint destruction and higher levels of remission (van der Linden et al., 2010). Following the so-called "window of opportunity," when initiation of treatment has the highest probability of improving long-term outcomes, the probability of better outcomes decreases and never returns to the higher level of probability associated with early initiation of treatment (van der Linden et al., 2010).

Additionally, untreated rheumatoid arthritis is associated with a multitude of conditions (Young & Koduri, 2007). In the Young study, these associated conditions, referred to as extra-articular manifestations or non-articular complications, are seen in higher proportions among patients who have already been diagnosed with RA (Young & Koduro, 2007). In other studies, the manifestation of certain conditions, like normochromic normocytic anemia (Wilson, Hsing-Ting, Goodnough & Niessenson, 2004), have been correlated with decreased health-related quality of life. More specifically, RA can lead to conditions such as atherosclerosis and subsequent ischemic heart disease, which are aggravated by the inflammatory process prevalent in rheumatoid arthritis (Manzi & Wasko, 2000). Both of these conditions are common risk factors for both myocardial infarctions and cerebrovascular accidents, highlighting the importance of treating this disease early and aggressively. When the inflammatory process caused by RA is controlled through DMARDs, like methotrexate, and tumor necrosis factor alpha antagonists, such as etanercept or adalimumab, the potential for many of these complications are greatly reduced, thus improving health-related quality of life in these individuals (Manzi & Wasko, 2000).

Other important factors to consider in the early recognition and treatment of rheumatoid arthritis is improved the health-related quality of life individuals will experience and increased life expectancy.

In a randomized controlled trial examining the effects of methotrexate and etanercept treatment on the HR-QOL of patients diagnosed with RA, both drugs were shown to increase PCS scores by between 10 and 12 points, with etanercept showing improvements more rapidly than methotrexate (Kosinski et al., 2002). Since randomized controlled trials are analytic

studies, causation can be inferred from the results obtained, meaning methotrexate and etanercept lead to higher levels of quality of life in RA patients.

Another study focusing on the effects of rheumatoid arthritis on mortality found a significant decrease in life expectancy among patients with the disease, although this decrease can be greatly reduced through the use of DMARDs (Gabriel et al., 2003). The primary causes of shortened life expectancy in RA patients are extra-articular manifestations and non-articular complications, again emphasizing the importance of early detection and treatment (Gabriel et al., 2003).

For individuals with abnormal joint pain, stiffness, or discomfort, a visit to a general practitioner or referral to a rheumatologist would be the best course of action to either rule out rheumatic disease or immediately begin treatment to prevent typically irreversible long-term complications.

Despite the sampling issues faced in this study, two very important conclusions were drawn. First, any type of physician-diagnosed arthritis is associated with lower levels of health-related quality of life in regard to physical and general health, per Physical Component Summary (PCS) scores. Second, many more individuals reported symptoms of joint pain, stiffness or discomfort than reported physician-diagnosed arthritis, suggesting the potential for a subset of the population with undiagnosed arthritis, of which the consequences have been discussed in great detail. This study has provided researchers with areas to focus on in future studies and has contributed to the lack of data in the effects of arthritis on younger populations.

Clinical Implications and Future Research

The data collected from this study is clear: individuals with arthritis are significantly more likely to have lower quality of life scores in regard to physical health than individuals without arthritis. This may be a relatively obvious conclusion given the symptoms of the disease, but its significance should not be underestimated. This study did not ask participants to include details on their treatment for arthritis, so no inferences or assumptions can be made about the effects of possible treatment plans on lower PCS scores, but the statistics in this study, along with other arthritis quality of life studies begs the question: is there more physicians can be doing to improve the physical functioning of patients with arthritis? As discussed in the background section, drug therapy is the most common method of treating both rheumatoid arthritis and osteoarthritis, but if arthritis patients are continuing to score lower than individuals without arthritis, perhaps drug therapy isn't as effective as once thought. This by no means implies that long-used drugs are ineffective at treating arthritis, but it is suggesting that researchers must further explore options that may result in a reduction of symptoms for arthritis patients, that would improve health-related quality of life and allow patients to live easier, and more normal lives.

Based on the results from this study, one of the areas that future research should focus on is exploring ways of increasing the health-related quality of life for individuals with arthritis.

The data from this study clearly shows a correlation between having arthritis and lower PCS scores, indicating decreased quality of life. Future studies could investigate ways to improve the quality of life for arthritis patients so they don't have to be limited by the symptoms the disease causes. Currently, the treatment of choice in many rheumatology clinics across the

world is medication, and while studies have proven that disease-modifying anti-rheumatic drugs have a positive effect on arthritis patients, many medicated arthritis patients still score lower on quality of life scales than non-arthritis patients do (Picavet & Hoeymans, 2004). For one, DMARDs like methotrexate can cause GI symptoms (nausea, vomiting, stomatitis), liver disease, alopecia, and neurological side effects, all of which would contribute to lower health-related quality of life scores (Weisman, et al., 2006). Also, the level at which medications improve one's quality of life plateau at a certain point, usually after about one year of treatment (Kosinski et al., 2002), so if one still experiences symptoms of the disease at this point, there may not be much more improvement through drug therapy.

Alternatively, newer studies on arthritis physical functioning have shown that physical therapy can have positive effects on improving symptoms of joint pain, joint stiffness, and loss of physical mobility, thereby improving quality of life. In a randomized controlled trial of osteoarthritis patients, individuals treated at a physical therapy clinic showed larger improvements on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) than individuals in a control group who continued normal at home exercises (Deyle et al., 2005). A similar effect was seen in rheumatoid arthritis patients (Forestier et al., 2009).

One study will not change years of positive results from drug therapy, but the result from the Deyle study does suggest the addition of physical therapy could be beneficial to arthritis patients. The research process is based on improving the status quo, especially when the status quo leaves a lot of room for improvement. On an individual basis, rheumatologists should be open to providing patients with the option of pursuing physical therapy treatment if they deem it beneficial.

Future randomized controlled trials testing the influence of physical therapy treatment on quality of life scores should be done to further test this relationship. Since RCTs can infer causation, this would be the most effective way of testing for such an influence.

In regard to epidemiology, future public health research must find and develop ways to identify arthritis, particularly rheumatoid arthritis, early and implement treatment quickly and effectively, given the serious consequences of implementing treatment as previously discussed in this thesis. First, epidemiologists must identify the populations where RA is prevalent, perhaps through passive surveillance, the use of available data (typically from medical or hospital records) to monitor disease frequency and potential risk factors for said disease (Gordis, 2014). Once initial prevalence rates are calculated among different populations, educational programs can be targeted to those populations at particular risk for developing RA.

In a study focusing on the impressions and attitudes regarding rheumatoid arthritis, results showed that individuals in the general public have little to no awareness of rheumatoid arthritis and many participants in this study did not view the disease as serious (Sheppard, Kumar, Buckley, Shaw & Raza, 2008). Additionally, many participants didn't think they were at risk for RA due to their younger age; many believed RA was only a disease that affects older adults (Sheppard et al., 2008). This lack of information on behalf of many "ordinary" individuals could directly lead to a more serious case of RA (with more joint damage and a higher risk of comorbidities) if they were to develop the disease. If individuals are aware of both early signs of RA and the dangerous implications of waiting to seek treatment, they should be more likely to visit their primary care physician, who can then refer them to a rheumatologist for more specialized treatment.

Such preconceived notions and attitudes about other chronic diseases could lead to similar outcomes, so epidemiologists and public health officials should be aware of this problem and must develop ways to close the knowledge gap and protect potential RA patients from their own attitudes and beliefs.

Limitations

Sampling

The most significant challenge faced in the planning and conduction of this study was how to effectively sample. Given strict time constraints and the fact that this study was done for the completion of an undergraduate thesis meant that direct patient contact was not an option, so a self-reported questionnaire was used. The initial plan was to distribute the questionnaire via a campus-wide email to the entire student body, faculty and staff at the University of Central Florida, with the possibility of reaching over 60,000 potential participants; however, an agreement was not able to be made between the researchers and the various campus outlets responsible for the dissemination of such email messages, so the questionnaire was sent to all students (undergraduate and graduate/professional), faculty, and staff within the College of Health and Public Affairs (COHPA), which was made up of just over 10,000 potential respondents. This led to an inevitable selection bias, since a study designed to sample from the entire UCF population was limited to participants from one subset of the university. Perhaps the largest source of selection bias came from the unequal gender proportions within COHPA; student-wise, 70.5% of COHPA is made up of females and 29.5% of males. Population data was not available for staff and faculty, but since students made up most of the potential sample, the gender of students has the largest effect on the results. Further analysis of the gender gap can be found in the "Gender and HR-QOL" section.

Use of Self-Reported Data

The use of self-reported surveys or questionnaires always introduces the potential for response biases and misclassification biases. For one, out of over 10,000 questionnaires sent out,

only 333 responses were received, meaning that over 95% of potential participants failed to respond. While it is likely that most people who didn't respond didn't do so because of the subject of the study, but rather didn't see the email or never read it, a nonresponse bias exists.

Many previous studies utilizing a self-reporting mechanism of obtaining data have found a social desirability bias affecting the results (van de Mortel, 2008). Without a researcher directly facilitating the data collection process, participants in self-reported studies tend to answer questions that project themselves in a more favorable light (van de Mortel, 2008). Reasons for this are not understood, especially since all responses in this study (and in most self-reported studies) were anonymous, but nevertheless, it is still a weakness of self-reported data and may have diminished this study's external validity.

Finally, there is no way of verifying the answers of questions in the screener survey, used to classify participants, which could have created a misclassification bias in the results. The main point of comparison in this study was the presence (or absence) of physician-diagnosed arthritis and any error in the self-reported answers of this question would not be accurate and negatively affected the study results.

Any limitations encountered in the study affect the ability with which its findings can be generalized to the target population (students, faculty, and staff at universities around the United States). When generalizability is diminished, the power a study has to speak about associations in a larger context is affected. These issues aren't as serious in cross-sectional studies as they would be in experimental studies where causality can be inferred. Many of the associations found in this study have been found in other, very reliable studies and the conclusions drawn from this study's results are ones that have been seen in the literature.

Appendix A: Screener Survey

Screener Survey

1. Are you 18 years of age or older?
    a. Yes
    b. No (end survey)
2. What is your age range?
    a. 18-22
    b. 23-27
    c. 28-32
    d. 33-39
    e. 40-49
    f. 50-59
    g. ≥ 60
3. What is your gender?
    a. Male
    b. Female
    c. Other
4. What is your ethnicity?
    a. American Indian or Alaska Native
    b. Asian
    c. Black or Native American
    d. Native Hawaiian or Other Pacific Islander
    e. White
    f. Hispanic or Latino
    g. Other
5. What is your status at UCF (mark all that apply)?
    a. Faculty
    b. Staff
    c. Graduate Student
    d. Undergraduate Student
    e. Non-degree Seeking Student
6. What is your classification?
    a. Freshman (1-30 credit hours)
    b. Sophomore (31-60 credit hours)
    c. Junior (61-90 credit hours)
    d. Senior (91-120 credit hours)
    e. Senior (120+ credit hours)

7. During the past few months, have you had any symptoms of pain, aching, or stiffness in or around a joint?
    a. Yes
    b. No
    c. Don't know
8. Have you ever been told by a doctor or other health professional that you have some form of arthritis?
    a. Yes (go to question 9)
    b. No (go to the SF-36 survey)
    c. Don't know
9. What type of arthritis were you diagnosed with?
    a. Rheumatoid Arthritis
    b. Osteoarthritis
    c. Other (please specify)

Appendix B: 36-Item Short Form Survey Instrument (SF-36)

36-Item Short Form Survey Instrument (SF-36)

1. In general, would you say your health is:
    a. 1 - Excellent
    b. 2 - Very good
    c. 3 - Good
    d. 4 - Fair
    e. 5 - Poor
2. **Compared to one year ago**, how would you rate your health in general **now**?
    a. 1 - Much better now than one year ago
    b. 2 - Somewhat better now than one year ago
    c. 3 - About the same
    d. 4 - Somewhat worse now than one year ago
    e. 5 - Much worse now than one year ago

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

3. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports
    a. 1 - Yes, limited a lot
    b. 2 - Yes, limited a little
    c. 3 - No, not limited at all
4. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf
    a. 1 - Yes, limited a lot
    b. 2 - Yes, limited a little
    c. 3 - No, not limited at all
5. Lifting or carrying groceries
    a. 1 - Yes, limited a lot
    b. 2 - Yes, limited a little
    c. 3 - No, not limited at all
6. Climbing **several** flights of stairs
    a. 1 - Yes, limited a lot
    b. 2 - Yes, limited a little
    c. 3 - No, not limited at all
7. Climbing **one** flight of stairs
    a. 1 - Yes, limited a lot

b. 2 - Yes, limited a little
c. 3 - No, not limited at all

8. Bending, kneeling, or stooping
    a. 1 - Yes, limited a lot
    b. 2 - Yes, limited a little
    c. 3 - No, not limited at all
9. Walking **more than a mile**
    a. 1 - Yes, limited a lot
    b. 2 - Yes, limited a little
    c. 3 - No, not limited at all
10. Walking **several blocks**
    a. 1 - Yes, limited a lot
    b. 2 - Yes, limited a little
    c. 3 - No, not limited at all
11. Walking **one block**
    a. 1 - Yes, limited a lot
    b. 2 - Yes, limited a little
    c. 3 - No, not limited at all
12. Bathing or dressing yourself
    a. 1 - Yes, limited a lot
    b. 2 - Yes, limited a little
    c. 3 - No, not limited at all

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

13. Cut down the **amount of time** you spent on work or other activities
    a. 1 - Yes
    b. 2 - No
14. **Accomplished less** than you would like
    a. 1 - Yes
    b. 2 - No
15. Were limited in the **kind** of work or other activities
    a. 1 - Yes
    b. 2 - No
16. Had **difficulty** performing the work or other activities (for example, it took extra effort)
    a. 1 - Yes
    b. 2 - No

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

17. Cut down the **amount of time** you spent on work or other activities
    a. 1 - Yes
    b. 2 - No
18. **Accomplished less** than you would like
    a. 1 - Yes
    b. 2 - No
19. Didn't do work or other activities as **carefully** as usual
    a. 1 - Yes
    b. 2 - No
20. During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?
    a. 1 - Not at all
    b. 2 - Slightly
    c. 3 - Moderately
    d. 4 - Quite a bit
    e. 5 - Extremely
21. How much **bodily** pain have you had during the **past 4 weeks**?
    a. 1 - None
    b. 2 - Very mild
    c. 3 - Mild
    d. 4 - Moderate
    e. 5 - Severe
    f. 6 - Very severe
22. During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?
    a. 1 - Not at all
    b. 2 - A little bit
    c. 3 - Moderately
    d. 4 - Quite a bit
    e. 5 - Extremely

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

How much of the time during the **past 4 weeks**…

23. Did you feel full of pep?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - A good bit of the time
    d. 4 - Some of the time
    e. 5 - A little of the time
    f. 6 - None of the time
24. Have you been a very nervous person?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - A good bit of the time
    d. 4 - Some of the time
    e. 5 - A little of the time
    f. 6 - None of the time
25. Have you felt so down in the dumps that nothing could cheer you up?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - A good bit of the time
    d. 4 - Some of the time
    e. 5 - A little of the time
    f. 6 - None of the time
26. Have you felt calm and peaceful?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - A good bit of the time
    d. 4 - Some of the time
    e. 5 - A little of the time
    f. 6 - None of the time
27. Did you have a lot of energy?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - A good bit of the time

d. 4 - Some of the time
e. 5 - A little of the time
f. 6 - None of the time

28. Have you felt downhearted and blue?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - A good bit of the time
    d. 4 - Some of the time
    e. 5 - A little of the time
    f. 6 - None of the time
29. Did you feel worn out?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - A good bit of the time
    d. 4 - Some of the time
    e. 5 - A little of the time
    f. 6 - None of the time
30. Have you been a happy person?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - A good bit of the time
    d. 4 - Some of the time
    e. 5 - A little of the time
    f. 6 - None of the time
31. Did you feel tired?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - A good bit of the time
    d. 4 - Some of the time
    e. 5 - A little of the time
    f. 6 - None of the time
32. During the **past 4 weeks**, how much of the time has **your physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?
    a. 1 - All of the time
    b. 2 - Most of the time
    c. 3 - Some of the time
    d. 4 - A little of the time
    e. 5 - None of the time

How TRUE or FALSE is **each** of the following statements for you.

33. I seem to get sick a little easier than other people
    a. 1 - Definitely true
    b. 2 - Mostly true
    c. 3 - Don't know
    d. 4 - Mostly false
    e. 5 - Definitely false
34. I am as healthy as anybody I know
    a. 1 - Definitely true
    b. 2 - Mostly true
    c. 3 - Don't know
    d. 4 - Mostly false
    e. 5 - Definitely false
35. I expect my health to get worse
    a. 1 - Definitely true
    b. 2 - Mostly true
    c. 3 - Don't know
    d. 4 - Mostly false
    e. 5 - Definitely false
36. My health is excellent
    a. 1 - Definitely true
    b. 2 - Mostly true
    c. 3 - Don't know
    d. 4 - Mostly false
    e. 5 - Definitely false

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