AQUATIC EXERCISE AND PAIN MANAGEMENT: AN EXAMINATION OF THE EFFECTS OF FREQUENCY AND DURATION OF PARTICIPATION ON OLDER ADULTS WITH ARHRITIS

by

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Arthritis is a leading cause of disability for adults in the United States making the chronically progressive condition one of the most common causes of chronic pain. The purpose of this study is to examine the effects of frequency and duration in a community-based Arthritis Foundation Aquatic Program (AFAP) on the pain level of older adults with arthritis. The study population consisted of 27 adults with arthritis currently attending AFAP classes at the local wellness center. Data were collected using a facility developed self-report form. Results indicated a significant decrease in pain from Time 1 to Time 2. However, results demonstrated that there were no significant associations between the frequency or/and duration of their involvement in the aquatic exercise program and this improvement in arthritis pain. This research study suggests that AFAP is assisting in the treatment of the symptoms and pain management in older adults with arthritis.

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Table of Contents

SECTION I: MANUSCRIPT

Introduction

Arthritis affects 22.5% of adults within the United States making the joint disease a leading cause of disability (Arthritis Foundation, 2017). There are over 100 rheumatoid diseases included within arthritis that affect the joint and its surrounding tissues and connective tissues (Walsh & McWilliams, 2012). Arthritis is characterized by restricted range of motion, pain, stiffness, aching, and swelling throughout and around the joint or joints (Yoon & Doherty, 2008). The most common forms of arthritis are osteoarthritis, rheumatoid arthritis, lupus fibromyalgia, and gout (Centers for Disease Control, 2017).

Treatment of arthritis typically includes medications and non-pharmacological approaches such as therapy (e.g., physical, aquatic) and assistive aids; surgery is used as a last option (Walsh & McWilliams, 2012). Painkillers or non-steroidal anti-inflammatory drugs (NSAIDs) are the medications generally used to treat acute arthritis pain symptoms, but research has suggested that they may have little effect on chronic conditions such as arthritis (Pendick, 2015). In addition, these medications may exacerbate symptoms (Centers for Disease Control, 2017) and cause many complicating side effects such as drowsiness, constipation, depression, and accidental overdose (Scarpignato et al., 2015).

The Centers for Disease Control and Prevention (CDC) recommends several non-pharmacological methods to manage arthritis, including self-management education, maintaining a healthy weight, and physical activity. Physical activity has proven to be beneficial for symptoms management in individuals diagnosed with arthritis. A moderate intensity and low impact exercise program can assist in improving pain, overall physical function, mobility, mood, and quality of life without causing exacerbation of symptoms (Arthritis Foundation, 2017).

Despite these benefits, many adults with arthritis are physically inactive due to their symptom severity (Mielenz, Edwards, & Callahan, 2011), and research suggests that only 24% of individuals with arthritis meet the recommended daily levels of physical activity (Ehrlich-Jones et al., 2011).

Aquatic Exercise and Arthritis

Symptom severity can be a barrier to participation in exercise due to pain, stiffness, or fatigue (Janke, Son, Jones, Payne, & Anderson, 2015). The level of disability caused by arthritis symptoms may also lead to a sense of overall helplessness in individuals who experience chronic pain, which makes it difficult for adults to manage their condition (Janke et al.). However, exercise has been suggested as one of the best ways to alleviate some of the symptoms associated with arthritis (Centers for Disease Control, 2017), and it has the potential to ultimately increase quality of life and symptom self-management. The Arthritis Foundation reports that approximately half of adults with arthritis do not engage in physical activity making the self-management of the conditions difficult while increasing the risk of other chronic diseases (Arthritis Foundation, 2017). Self-management strategies are the actions taken, or not taken, by individuals in order to acclimate and manage their symptoms (Janke et al.). Self-management is extremely important when treating arthritis due to the fact that symptoms vary for each individual and pain is perceived differently by each person. If individuals cannot participate in the activities they used to do, this can increase the likelihood of depression and diminish their quality of life (Bamman, Wick, Carmona-Moran, & Bridges, 2016).

There is strong support in the research regarding the importance of exercise in managing the pain and symptoms of arthritis. Several studies have specifically noted the effects of water-based exercises, such as aquatic therapy, in alleviating pain and improving the health and well-

being of adults with this condition. Gusi, Tomas-Carus, Häkkinen, Häkkinen, and Ortega-Alonso (2006) investigated the immediate and lasting effects of warm aquatic exercise in women diagnosed with fibromyalgia. The researchers randomly assigned 34 women to either an aquatic exercise or control group. The aquatic exercise classes were scheduled three times a week over 12 weeks. The adults in the aquatic exercise group reported a significant increase in quality of life and strength as well as a decrease in pain; however, there was no change in the control group and the effects of aquatic exercise were not found to be sustained over time.

Hinman, Heywood, and Day (2007) investigated the effects of aquatic physical therapy in 71 adults with osteoarthritis who were randomly assigned to the exercise or control group. The intervention lasted over a six-week period with data collected at weeks one, six, and 12 (6 weeks after the intervention was concluded). Results indicated significant improvements in physical function, pain, hip muscle strength, and quality of life among those adults in the aquatic therapy group when compared to the control group at the completion of the six-week program. The aquatic physical therapy group also sustained significant improvements in pain when tested again six weeks after treatment ended. Alternatively, Gusi et al. (2006) found that there is a potential for the effects of aquatic exercise programs to have sustained long-term effects on participants' health and wellbeing.

Segura-Jiménez et al. (2013) investigated immediate pain during and after an exercise program and change in pain levels prior to and after water-based exercises. The exercise program was offered two times a week for 12 weeks. The results indicated significant improvements in older participants' pain level tolerance, especially among those who had more intense symptoms. Ansari, Elmieh, and Hojjati (2014) found that aquatic exercise was effective in reducing arthritis symptoms at follow up. Ansari and colleges (2014) examined the effect of aquatic exercise on 30

men with knee osteoarthritis. Participants were randomly assigned to either the exercise or control group. The aquatic exercise classes were offered three times a week over six weeks. The findings indicated significant improvement in pain, symptoms, motor performance, activities of daily living, and quality of life for those in the exercise group compared to the men in the control group.

Łyp et al. (2016) compared the effects of a rehabilitation program that included water exercises prior to and after hip replacement in 192 adults with arthritis. Participants were assigned to one of the four treatment groups or one of the two control groups. The rehabilitation programs were offered five times a week over three weeks. The participants noted significant improvement in pain, range of motion, muscle strength, and medication use within the treatment group that included water-based exercises, both prior to and after hip replacement, when compared to individuals who only received a traditional rehabilitation program. These findings demonstrate the added benefit of incorporating an aquatic exercise regimen into rehabilitation to assist in reductions in pain and medication use among adults with arthritis.

Research clearly supports that aquatic exercise has many potential benefits for adults with arthritis including improvements in pain tolerance (Segura-Jiménez et al., 2013), strength, quality of life (Gusi, et al., 2006), physical function (Hinman et al., 2007), range of motion, medication use (Łyp et al., 2016), symptoms management, and activities of daily living (Ansari, Elmieh, & Hojjati, 2014). Davis and Nelson (2015) compared the results of six different studies on aquatic exercise programs and found that, although the programs were structured differently, a program scheduled three times a week over six to 12 weeks would be the most beneficial in reducing arthritis symptoms including pain. While research has demonstrated the efficacy of aquatic exercise in the treatment of arthritis and arthritis-related conditions, many of these

studies have focused on samples of adults in rehabilitation or therapy settings. In addition, research has been based on several different aquatic exercise programs, which may provide different types of exercises and intensity of exercises. This makes it more challenging to compare the findings and outcomes from these studies.

Arthritis Foundation Exercise Program

The AFAP is the aquatic exercise program used at the current study site. Program sessions are typically offered two to three times a week for a duration of one hour. They are structured to include activities that focus on range of motion, stretching, breathing techniques, and light aerobic exercises. The CDC indicates that participants who engage in exercise at least two times a week reported increased improvements in well-being, quality of life, and physical function (Centers for Disease Control, 2017), highlighting the importance and benefits of adhering to an exercise program for adults with arthritis.

Zgibor et al. (2016) most recently examined the effects of the Arthritis Foundation Exercise Program (AFEP), as well as the AFEP paired with an online training program. The program was offered over 10 weeks, and data were collected again at a six-month follow up. There were 416 participants enrolled in this study with a mean age of 73. The results indicated that both groups reported significant improvements in physical performance and arthritis outcomes of pain, stiffness, and function.

Wang, Thompson, Whitney, and Bennett (2007) investigated the effects of the AFAP program on older adults with osteoarthritis. Data were collected at baseline as well at weeks 6 and 12 of the program. Adherence to the aquatic classes was measured by the percentage of classes the participant attended during the 12-week program (81.7%). The researchers randomly assigned 38 participants to the aquatic exercise or control group. The results indicated a

significant improvement in flexibility and strength. However, there was no indication of significant effects on physical function or pain for individuals in the aquatic exercise group in this study.

Belza, Topolski, Kinne, Patrick, and Ramsey (2002) examined the effects of adherence to a community-based aquatic exercise program on adults with osteoarthritis. The researchers randomly assigned 250 adults to an arthritis foundation aquatic exercise program group of a control group. The aquatic exercise classes were offered over 20 weeks. Adherence to the program was defined by attending a minimum of two classes a week for 16 of the 20 weeks. Results indicated an improvement in quality of well-being, physical function, and change in arthritis quality of life when compared to the control group. However, when comparing the group adherence levels, those classified as "adherers" improved in quality of well-being and depressed mood while those attended less than twice a week for a minimum of 16 weeks did not. This suggests that an increased level of participation leads to improved outcomes.

Summary of Literature

While aquatic therapy programs, and the AFAP in particular, appear to provide therapeutic benefits for individuals diagnosed with arthritis, there is little indication of how often (frequency) and how long (duration) adults need to attend the program to experience benefits in a community setting. Davis and Nelson's (2015) review of studies on aquatic exercise programs for adults with osteoarthritis noted that the programs were all structured differently. They recommended that programs be offered for at least a period of three times a week for 40 to 60 minutes and be offered over six to 12 consecutive weeks at a minimum to reduce arthritis pain symptoms. However, guidelines regarding community-based exercise programs where involvement is voluntary and potentially long-term, such as the AFAP, are unclear. This

information would guide recreational therapists on the frequency and duration required when offering this intervention in order to help control and manage pain. The purpose of this study is to examine the effects of frequency and duration in a community-based Arthritis Foundation Aquatic Program on the pain levels of older adults with arthritis.

Research Questions

1. Does aquatic exercise significantly change pain levels of people with arthritis?
2. Do frequency and duration of involvement in aquatic exercise predict the pain levels of people with arthritis at Time 2?

Method

Design and Study Location

This study uses a panel longitudinal design. Data were collected on the same participants using an intake assessment when they began the aquatic therapy program and then collected again in September 2017. All respondents in this study participated in the Arthritis Foundation Aquatic Program (AFAP) at an eastern North Carolina Wellness Center affiliated with a local hospital.

This is a medically modeled facility that focuses on disease management and provides a wide range of professional fitness training in association with outpatient medical care. The facility is open to the community, employees, and patients within the healthcare system. The aquatic arthritis program specifically offers services to those who experience chronic pain from arthritis and other rheumatic diseases. All instructors at this site are nationally certified by the Arthritis Foundation, under the Aquatic Exercise Association (AEA), to ensure delivery of consistent, safe, and appropriate instruction.

Sample

The study included individuals aged 45 and older with a diagnosis of arthritis who experience arthritis-related pain. All respondents attended the AFAP aquatic exercise arthritis classes offered at the Wellness Center. Convenience sampling was used to recruit individuals into this study. Participants with a diagnosis of dementia or other related significant cognitive deficits were excluded from this study due to the need for participants to recall information concerning their past participation in the aquatic exercise classes. The final sample size included 27 adults, of which 44.4% were aged 45-60, 48.1% were aged 61-75, and 18.5% were aged 76 above (M = 66.56, SD = 3.715). There was no cut off age to this study; the oldest respondent was

90 years old. In addition, when asked how much of their pain was related to arthritis, 44.4% of participants reported that their pain was "somewhat related" to their arthritis, while 51.9% indicated that it was "extremely related" to their diagnosis of arthritis.

Data Collection

Prior to data collection, the principle investigator (PI) identified which participants had previously completed the intake assessment with the aquatics department manager at the Wellness Center. The PI then approached those individuals prior to a scheduled arthritis class and asked them to participate in the study and sign the informed consent form (Appendix H). Participants completed the assessments themselves in order to minimize bias, and the assessment was administered in a private room located on the facility's campus to ensure discretion for all participants. Data collection took approximately five minutes with each participant. Data were collected prior to each arthritis class during a two-week period in September 2017. The baseline measurements for each participant were gathered through a chart review of their intake assessments.

Arthritis classes were typically offered 15 times a week, each class lasted one-hour (see Appendix C for a monthly class schedule). The number of attendees varied at each session, and the instructors rotated across sessions. However, all instructors followed the Arthritis Foundation protocol for each class. All classes focus on flexibility and range of motion, muscular strength and endurance, cardiorespiratory endurance, and balance and coordination, as well as a warm-up/cool-down and relaxation component. A general lesson plan can be found in Appendix D. Additionally, instructors in this facility are required to maintain valid certification with the AEA while teaching at the Wellness Center. This certification helped ensure that the aquatic exercise sessions consistently followed the established protocol despite which instructor led them.

Study Variables

The independent variables for this study were the aquatic exercise and the characteristics about the AFAP classes offered at the facility. The dependent variable was the pain level experienced by older adults with arthritis. Other personal and demographic variables such as age, height, weight, secondary diagnoses, other pain relief measures and frequency and duration of participation in aquatic exercise were collected as part of this research to provide a description of the sample population for this study.

Aquatic exercise classes. These variables identified how long and how often the aquatic exercise classes have been utilized by participants. The frequency of participation was assessed with the question "How often do you attend aquatic classes at the center during a typical month?". This was measured as a continuous variable as the number reported by each individual. The duration of the adults' involvement in the AFAP was assessed with the question, "How long have you attended arthritis classes at the center?". This was also measured using a continuous variable based on the number of months the individual reported participating in the AFAP program.

Pain. The intake (Time 1) and follow up (Time 2) assessment asked questions regarding how much of the participants' pain was related to arthritis. The items to measure pain at Time 1 (Appendix B) and Time 2 (Appendix G) were identical; the chronic pain areas were established by the aquatic staff at Time 1 and repeated in the self-report form administered by the PI at Time 2. Pain level in this study was measured using an 11-point scale (Range: 0 – 10) on different areas of the body (e.g., neck, back, spinal stenosis, leg/hip, pinched nerve, joint, inflammatory, degeneration, and neuropathic pain), similar to the *Numeric Pain Rating Scale* (NRS; McCaffery & Beebe, 1989). The NRS has demonstrated acceptable test-retest reliability and validity

(Hawker, Mian, Kendzerska, & French, 2011). Pain severity scores were summed across the nine regions of the body that were collected Time 1 and Time 2 to create an overall measure of pain. These composite scores were used to compute a change in pain score that was calculated as Time 2 – Time 1. Higher scores on these variables indicated a greater severity of pain. In addition, any other pain relief measures the adults had started since the intake assessment were recorded in the Time 2 assessment.

Data Analysis

SPSS 23 was used for the analysis. First, descriptive statistics on the sample population were conducted. Second, the research questions were tested using a paired samples *t*-test and a multiple regression analysis. The *t*-test was performed to determine whether there was significant change in the participants' reports of pain level since their intake assessment. Bi-variate correlations were examined to determine significant associations between the study variables. The regression analysis examined whether frequency and duration of aquatic exercise participation were significant predictors of change in arthritis-related pain levels for the adults in this study.

Results

The average length of participants' involvement in the AFAP program was eight months (M = 8.59, SD = 6.86, Range = 1 – 24) while the average frequency of involvement in the program was approximately nine classes a month (M =8.96, SD = 3.39, Range = 2 – 20). In addition, 29.6% of participants reported that they did not engage in any other pain relief measures; however, 14.8% reported walking, 7.4% reported additional aquatic exercise, 22.2% indicated they use pain medication, and 25.9% stated they use orthotics. Only 7.4% of participants indicated they had two other secondary conditions, and 11.1% of participants reported that they had one other condition and in addition to arthritis. The majority of participants (81.5%) stated that they had no other underlining health conditions. Information about the participants' location of pain and its severity at T1 and T2 is presented in Table 1.

The paired *t*-test analysis showed that pain levels significantly decreased since the adults had begun the aquatic therapy program ($t(26) = 3.71$, $p < .001$). The mean value of pain reported at Time 1 was 20.85, and this value had decreased to 15.32 by Time 2. See Table 2 for complete results.

The correlation analysis did not reveal any significant relationships between the study variables. Change in pain scores were not statistically associated with the adults' frequency of involvement or duration of involvement in the aquatic therapy program. An interaction variable was also computed to assess the combined effect of frequency of adults' attendance and the duration of their involvement in the aquatic therapy program (i.e., frequencyXduration), but this term was not significantly associated with change in pain. There was also not a significant association between the duration and frequency of involvement between participants.

Table 1
Average Pain Level at Time 1 and Time 2

	Time 1			Time 2			Time 1 - Time 2
Average Pain Level	M	SD	Range	M	SD	Range	Mean Change
Neck	2.15	2.95	0-10	1.56	2.54	0-8	.59
Back	4.67	3.50	0-10	3.81	2.76	0-8	.86
Spinal Stenosis	.70	2.16	0-10	.30	1.54	0-8	.4
Leg or Hip	3.74	3.38	0-10	2.74	2.66	0-8	1
Pinched Nerve	.48	1.98	0-10	.00	.00	0	.48
Joint	3.81	2.97	0-10	3.30	2.68	0-9	.51
Inflammatory	2.33	3.38	0-10	1.74	2.86	0-9	.59
Degeneration	2.37	3.34	0-10	1.70	2.78	0-8	.67
Neuropathic	.59	1.69	0-7	.30	1.54	0-8	.29
Composite Measure	20.85	14.26	0-55	15.44	12.32	0-46	5.41

Table 2
Results of the Paired T-test Analysis

	Time 1		Time 2			95% CI for Mean Difference		
	M	*SD*	*M*	*SD*	*N*		*t*	df
Pain	20.85	14.26	15.44	12.32	27	2.41, 8.40	3.71***	26

*P*** ≤ .001.

Although no significant relationships were found, to test the second research question a linear regression model was used to verify the lack of relationship between study variables. This regression model was not significant as shown in Table 3.

Table 3

Predictors of Change in Pain

	B	SE	β
Frequency of Participation	-.006	.456	-.003
Duration of Participation	.012	.226	.011
R^2	.000		
F	.001		

Discussion

Although this study did find that reports of pain significantly decreased from Time 1 to Time 2 for the study participants, there was no significant association between the frequency or duration of their involvement in the aquatic exercise program and improvement in arthritis pain. There are a few factors that might have attributed to these findings. First, the sample size was limited with only 27 participants, which could be the result of sporadic attendance or schedule conflicts. Participation in the program is completely voluntary and participants choose which classes they will attend; therefore, if scheduling conflicts occur, there is no penalty for not attending class sessions or obligation for the participant to attend a certain number of classes each week. An additional explanation for the small sample size is that some participants at the facility mentioned the desire to be put on the wait list to switch classes, or put their membership on hold to change to fit their current schedules and needs. Several participants who were eligible for the study may have not been attending classes during the short data collection period, and therefore, not included in the study. In addition, the limited sample size may also have been due to members' choice to cancel their enrollment in the classes or take medical leave from the program due to joint-replacement surgeries. Some individuals who did attend the aquatic exercise classes during the study period could not be included in the sample because they did not have an intake assessment (Time 1 data) on file with the facility. The aquatics manager reported that only 41% of current members have previously completed an intake form as it is completely optional and it is a relatively new procedure at the facility (2015).

Most of study's participants had been involved in the program for several months (M = 8.59); this is not necessarily typical of all adults with arthritis. Many adults discontinue physically engaging activities due to their pain level (Janke et al., 2015). This may be an

indication of the participants' ability to successfully self-manage their condition, and is likely an indicator that these adults have higher self-efficacy and greater ability to self-regulate healthy behaviors such as aquatic exercise than the general population of adults with arthritis. This may be influenced by or related to the participants' ability to see long-term outcomes and actually be able to manage their pain through aquatic exercise. However, this also means that individuals in this study were also likely engaging in other self-management strategies for their arthritis pain and symptoms, and whether they had engaged in other health promoting strategies prior to their involvement in aquatic exercise (e.g., land-based exercise) is unknown. This sample did report engaging in a few other treatments to manage their pain including additional exercise on land (i.e., walking) and in the water (i.e., additional aquatic exercise). This is potentially one reason why there was no differentiation between the frequency and duration of their involvement and pain scores in this study.

The change in pain scores for the participants in this study might be a factor of variables that were not captured in the data collection and thus not entered into the analysis. This includes various changes in lifestyle behaviors such as weight loss, fluctuating diet and medication use, and other self-management strategies, in addition to the increased exercise, land-based or aquatic, that some adults already noted in addition to the aquatic classes offered through the Arthritis Foundation Aquatic Program. These factors may have affected the lack of significance due to the effect on pain level that these other lifestyle changes may have.

In addition, the measurements used in this study to capture pain levels and aquatic therapy involvement were not standardized and may have also influenced the findings in this study. The pain assessment was an agency-specific scale and was created only two years prior to this study by the aquatics department. No detailed attendance is taken in this program; thus,

frequency and duration were measured retrospectively through the adults' recall of their participation. Participants may have had difficulty accurately remembering this frequency and duration of participation. Although a limitation, using recall as a method for identifying frequency and duration of participation was appropriate to use for this study site. This method was utilized because the Wellness Center is not solely a therapeutic program; therefore, the site and staff and this facility are not equipped to collect this detailed information. The participants' involvement in classes is completely by choice and voluntary.

A final limitation of this study is the research design used. A longitudinal, panel design was used for this study. One restriction of this design was that there was no control group for comparison purposes. In addition, the lack of controls related to the participants' lifestyle changes meant that it was impossible to identify if the change in pain from T1 to T2 was due to aquatic exercise alone or from a combination of other self-management strategies. The intake assessment was administered by the facility staff at T1, and the researcher administered the self-report form at T2. It is possible there was a lack of consistency in administration at the two time points, which may have also affected how pain was recorded and affect the accurate representation of the sample.

However, it is important to note that a strength of the study is the finding of significant declines in overall pain scores over time in adults with a condition that is chronic and progressive. That is, instead of just managing pain for these adults, there was actually a reduction in their pain across this study period. This sample appeared to be able to optimize their functioning while dealing with a chronic and progressive condition such as arthritis. This finding is consistent with the findings of Lim, Tchai, and Jang (2010) and Evcik, Yigit, Pusak, and Kavuncu's (2008). Lim et al. (2010) found that while both land-based and aquatic exercise

groups improved when compared to the control group, the aquatic exercise group significantly improved in pain and quality of life, while also reporting a significant decrease in body fat. The aquatic group reported a greater decrease in pain over the study period as well. This supports the findings from Evick et al. (2008) who found significant increases in functional capacity and quality of life with a decrease in pain for both exercise groups but a long-term improvement in pain was only observed in the aquatic group. Thus, it appears that the self-management strategies that the participants are engaging in, including their involvement in the AFAP, is assisting in the treatment of the symptoms and pain management in older adults with arthritis. This ability to maintain exercise despite the diagnosis of arthritis may have additional benefits for adults such as the delay or prevention of the onset of other chronic conditions and comorbidities.

Participants in this study were most likely the small percentage of adults who are already engaging in self-managing strategies, or rather not ceasing physical activity, to manage arthritis symptoms. This confirms that people with arthritis can indeed exercise without causing an increase in pain. There were no self-reported declines and all pain level areas decreased when measured at Time 2. In addition, only 22.2% of participants indicated medication use, which may also be an indication of their ability to manage pain better as a wellness strategy.

One of the goals of the Arthritis Foundation is patient education and the encouragement of healthy self-management behavior; this is in part due to the small percentage of adults with arthritis who engage in exercise. Adherence to an exercise program is important for adults with arthritis to achieve benefits. The fact that findings pertaining to the long-term effects of water exercise are mixed might be a factor of the fact that not all participants continue their participation in aquatic exercise after the completion of the study. Thus, the short duration of the aquatic exercise program in these studies may not have been long enough to promote adherence

in exercise behaviors. The focus of some of the aquatic programs used in this research is also unclear, and they may not have provided educational components in their intervention. This is an important consideration given that in order to affect behavior change, self-management programs should provide feedback and model healthy behaviors (Stitik, Foye, Stiskal, & Nadler, 2005).

Self-efficacy and self-regulation are two components of Bandura's social cognitive theory that are important in self-management programs. Self-efficacy is defined as the individuals' perception or confidence that they can engage a behavior or activity, such as self-management strategies. Self-regulation refers to a person's ability to monitor their behavior and focus on aspects of their functioning that are important to them (Janke et al., 2015). These two factors influence individuals' ability to manage their health and chronic conditions symptoms such as pain. Research based on this theory suggests that self-management strategies, such as participation in community exercise programs, can be beneficial in reducing symptom severity in adults with arthritis. Programs such as AFAP have been developed based on the concepts of self-efficacy and self-regulation, as they are important factors in the effective self-management of behavior. Thus, individuals' self-efficacy and use of self-regulation strategies would affect their adherence to a community-based program, such as aquatic exercise.

Adhering to an exercise program is important for maximizing benefits from an exercise program. However, research has noted that adults with arthritis may be hesitant or simply unwilling to engage in certain activities because of their pain and joint stiffness (e.g., Janke et al., 2015). Thus, the AFAP may increase confidence and self-efficacy of adults with arthritis and encourage them to regularly engage in exercise. By doing so, this program would help adults better self-manage the pain, stress, and fatigue often associated with arthritis.

Recommendations for research and practitioners in this field would be to begin with a six-month program consisting of a randomized controlled study where overall lifestyle changes such as frequency and duration of exercise and medication use are tracked and observed directly. The use of a standardized assessment that can accurately identify a change in symptoms, including pain, would also be important. In addition, a full attendance record should be maintained for each participant. Another recommendation for future studies is to gather data from multiple locations and not rely on one facility; this approach should result in a larger sample size and would enable the researcher to recruit a more diverse sample of participants that is more representative of older adults with arthritis in the U.S. population. In addition, self-efficacy levels could be assessed by using the *Arthritis Self-Efficacy Scale* (Lorig, Chastain, Ung, Shoor, & Holman, 1989), a standardized measure which has shown good reliability and validity. This Likert scale measure could be used to assess whether self-efficacy affects the participants adherence to exercise programs and its functional outcomes.

In future studies, recreational therapists should also attempt to directly observe change and refer to previous records of the clients' participation instead of relying purely on recall, such as the present study did. Recreational therapists can utilize a community-based program, like AFAP, with their clients to promote adherence to exercise and allow them to continuously engage in an aquatics exercise program for better self-management. The differentiation between community-based exercise programs such as AFAP, and a program offered in a clinical setting should be noted. Some issues during the data collection process were due to uncontrolled factors that are typically better controlled in a more clinical setting. However, the need to examine how these clinical trials translate to community programs is important, as these are necessary for adults to sustain their involvement in these health-promoting activities.

References

Ansari, S., Elmieh, A. R., & Hojjati, Z. (2014). Effects of aquatic exercise training on pain, symptoms, motor performance, and quality of life of older males with knee osteoarthritis. *Annals of Applied Sport Science, 2*(2), 29-38.

Arthritis Foundation. (n.d.). Arthritis facts. Retrieved November 07, 2017, from http://www.arthritis.org/about-arthritis/understanding-arthritis/arthritis-statistics-facts.php

Centers for Disease Control. (2017, March 14). Arthritis types. Retrieved from https://www.cdc.gov/arthritis/basics/types.html

Centers for Disease Control (2013, July 03). Prescription painkiller overdoses. Retrieved from https://www.cdc.gov/vitalsigns/prescriptionpainkilleroverdoses/index.html

Davis, J., & Nelson, R., (2015). Aquatic exercise for pain management in older adults with osteoarthritis. *Therapeutic Recreation Journal, 49*(4).

Ehrlich-Jones, L., Lee, J., Semanik, P., Cox, C., Dunlop, D., & Chnag, R. W. (2011). Relationship between beliefs, motivation, and worries about physical activity and physical activity participation in persons with rheumatoid arthritis. *Arthritis Care & Research, 63*(12), 1700-1707.

Evcik, D., Yigit, I., Pusak, H., & Kavuncu, V. (2008). Effectiveness of aquatic therapy in the treatment of fibromyalgia syndrome: A randomized controlled open study. *Rheumatology International, 28*(9), 885-890.

Gusi, N., Tomas-Carus., Häkkinen, A., Häkkinen, K., & Ortega-Alonso, A. (2006). Exercise in waist-high warm water decreases pain and improves health-related quality of life and strength in the lower extremities in women with fibromyalgia. *Arthritis & Rheumatism, 55*(1), 66-73.

Hawker, G. A., Mian, S., Kendzerska, T., & French, M. (2011). Measures of adult pain: Visual Analog Scale for pain (VAS pain), Numeric Rating Scale for pain (NRS pain), McGill pain questionnaire (MPQ), Short-From McGill pain questionnaire (SF-MPQ), Chronic Pain Grade Scale (CPGS), Short From-36 Bodily Pain Scale (SF-36 BPS), and Measure of Intermittent and Constant Osteoarthritis Pain (ICOAP). *Arthritis Care & Research, 63*(S11), S240-S252.

Hinman, R. S., Heywood, S. E., & Day, A. R. (2007). Aquatic physical therapy for hip and knee osteoarthritis: Results of a single-blind randomized controlled trial. *Physical Therapy, 87*(1), 32-43.

Janke, M. C., Son, J. S., Jones, J. J., Payne, L. L., & Anderson, S. K. (2015). Leisure patterns and their associations with arthritis-related self-management and health. *Therapeutic Recreation Journal, 49*(4), 281-292.

Lorig, K., Chastain, R. L., Ung, E., Shoor, S., & Holman, H. R. (1989). Development and evaluation of a scale to measure self-efficacy in people with arthritis. *Arthritis and Rheumatism, 32*(1), 34-44.

Łyp, M., Kaczor, R., Cabak, A., Tederko, P., Włostowska, E., Stanisławska, I., … Tomaszewski, W. (2016). A water rehabilitation program in patients with hip osteoarthritis before and after total hip replacement. *Medical Science Monitor, 22*, 2635-2642.

McCaffery, M., & Beebe, A. (1989). *Pain: Clinical manual for nursing practice.* St. Louis: Mosby.

Pendick, D. (2015, October 29). Report highlights the dangers of opioid painkillers. Retrieved from http://www.health.harvard.edu/blog/report-highlights-dangers-opioid-painkillers-201501157615

Scarpignato, C., Lanas, A., Blandizzi, C., Lems, W. F., Hermann, M., & Hunt, R. H. (2015). Safe prescribing of non-steroidal anti-inflammatory drugs in patients with osteoarthritis: An expert consensus addressing benefits and gastrointestinal as well as cardiovascular risks. *BMC Medicine, 13*(1), 1-22.

Segura-Jiménez, V., Carbonell-Baeza, A., Aparicio, V. A., Samos, B., Femia, P., Ruiz, J. R., & Delgado-Fernández, M. (2013). A warm water pool-based exercise program decreases immediate pain in female fibromyalgia patients: Uncontrolled clinical trial. *International Journal of Sports Medicine, 34*(7), 600-605.

Walsh, D. A., & McWilliams, D. F. (2012). Pain in rheumatoid arthritis. *Current Pain and Headache Reports, 16*(6), 509-517.

Yoon, E., & Doherty, J. B. (2008). Chapter 4; Arthritis Pain. *Journal of Gerontological Social Work, 50*(Sup1), 79-103.

Zgibor, J. C., Ye, L., Boudreau, R. M., Conroy, M. B., Bilt, J. V., Rodgers, E. A., ... Newman, A. B. (2016). Community-based healthy aging interventions for older adults with arthritis and multimorbidity. *Journal of Community Health*, *42*(2), 390-399.

SECTION II: EXTENDED LITERATURE REVIEW

Introduction

There are several different diagnoses that fall under the broad category of arthritis. Osteoarthritis causes the breakdown of the bones and cartilage surrounding a joint. Rheumatoid arthritis is an autoimmune inflammatory disease where the immune system damages cells and causes inflammation at the joint, which can also affect surrounding tissues such as the heart, lungs, or eyes. Lupus is another autoimmune inflammatory disease that causes the immune system to damage healthy cells and affects multiple systems within the body. Fibromyalgia is a form of arthritis that causes widespread pain in muscles and soft tissues. Gout is characterized by episodic pain, which typically results in temporary symptoms in a singular joint (Centers for Disease Control, 2017). Altogether, arthritis affects 54.4 million Americans and is a leading cause of disability for adults in the United States, making the condition one the most common causes of chronic pain (Arthritis Foundation, 2017).

Common risk factors of arthritis include age, gender, genetics, obesity, infection, and injury (Centers for Disease Control, 2017). These risks increase with age. Most diagnoses are made when the individual is over the age of 60 and it is predominantly diagnosed in women (Yoon & Doherty, 2008). Arthritis commonly co-occurs with other conditions such as heart disease, diabetes, and obesity (Walsh & McWilliams, 2012). This can increase the difficulty of disease management and diminish an individual's quality of life.

Physical activity has proven to be beneficial for symptom management in individuals with arthritis. An exercise program that is moderate intensity and low impact can improve pain, overall physical function, mobility, and quality of life without exacerbating symptoms (Arthritis Foundation, 2017). This review of literature will briefly discuss the exercise patterns of adults

with arthritis, identify some of the barriers and motivators to adherence to exercise in general for adults with arthritis, and expand upon the benefits of aquatic exercise and its effect on pain levels in older adults with arthritis.

Exercise and Arthritis

Evidence supports that exercise is beneficial in managing symptoms for those diagnosed with arthritis. An exercise program can often assist with adverse symptoms such as overall pain intensity and fatigue as well as provide an opportunity to improve mobility, which slows the loss of joint function and the advancement of this chronically progressive disease (Bamman, Wick, Carmona-Moran, & Bridges, 2016). Physical activity can reduce the risk of injury and delay the onset of other chronic conditions such as diabetes, heart disease, and obesity (Arthritis Foundation, 2017).

It is recommended that a structured aquatic exercise program be scheduled weekly (Bamman et al., 2016) and offered over at least 12 sessions to result in reduced pain (Juhl, Christensen, Roos, Zhang, & Lund, 2014). The Arthritis Foundation Aquatic Program is typically offered two or three times a week over 12 weeks, or preferably on a continuous basis (Arthritis Foundation, 2017). In addition, adhering to an exercise program is critical for ensuring the benefits of the program. The CDC indicates that participants who engage in some type of exercise at least two times a week reported greater improvements in well-being, quality of life, and physical function (Centers for Disease Control, 2017).

Despite the research and CDC recommendations, many individuals with arthritis do not engage in physical activity. Symptom severity can cause a barrier to participation in exercise due to pain, stiffness, or fatigue (Janke et al., 2015). There is a lower prevalence rate of exercise

among adults with arthritis when compared to the general population (Bamman et al., 2016). Approximately 24% of adults with arthritis are not getting the appropriate amount of physical exercise recommended (Bamman et al., 2016), and only 41% of adults over the age of 45 report engaging in self-management strategies, such as exercise (Janke et al., 2015).

Adherence to Exercise

Given that exercise has the potential to alleviate some of the symptoms associated with arthritis and ultimately increase adults' quality of life and symptoms self-management, it is important to identify what motivates some adults to exercise when statistics suggest that the majority of individuals with this chronic condition do not. Some research has examined the motivators or facilitators for exercise and physical activity in this population. Fisken, Keogh, Waters, and Hing, (2015) identified several motivators to physical exercise including alleviated pain and overall improvements in health and fitness. In addition, social interaction and instructor experience were both motivators to adherence. Social interaction was identified as peer support from exercising as a group, and an experienced instructor increased adherence by maintaining the participants interest (Fisken et al., 2015).

Bennell, Dobson, and Hinman (2014) found that when motivated by many factors, adults with arthritis are more likely to use their self-management strategies consistently. Knittle and colleagues (2013) reported that when these motivators were paired with physical activity, the commitment to the exercise program increased rather than if the motivators and the physical activity engagement were separate. Targeting these motivational factors led to an increase in physical activity motivators and therefore resulted in an increase in physical activity as well (Knittle et al., 2013). However, Sessford et al. (2017) noted that the perceived value of these

outcomes determines the level or adherence in an exercise program, and that although exercise is beneficial for adults with arthritis, adherence is still low due to symptoms severity.

Benefits of Aquatic Exercise for Arthritis

Gusi, Tomas-Carus, Häkkinen, Häkkinen, and Ortega-Alonso (2006) explored the immediate and lasting effects of warm aquatic exercise in women diagnosed with fibromyalgia. The researchers randomly assigned 34 women to either an aquatic exercise or control group. The aquatic exercise classes were scheduled three times a week over 12 weeks. Improved quality of life as well as a decreased pain was reported within the exercise group. However, these effects were not maintained over the long-term. This suggests that the utilization of aquatic exercise can be effective in improving pain management and others reported similar findings in consequent studies (Ansari, Elmieh, & Hojjati, 2014; Bressel, Wing, Miller, & Dolny, 2014; Hinman, Heywood, & Day, 2007).

Hinman, Heywood, and Day (2007) investigated the effects of aquatic physical therapy in 71 adults with osteoarthritis. Participants were randomly assigned to an exercise or control group. The intervention lasted over a six-week period with data collected at weeks one, six, and six weeks after the intervention was concluded (week 12). Results indicated significant improvements in pain, physical function, hip muscle strength, and quality of life for the adults participating in the exercise group when compared to the control.

Wang, Thompson, Whitney, and Bennett (2007) investigated the effects of aquatic exercise on older adults with osteoarthritis. Data was collected at baseline as well as weeks 6 and 12. Adherence to the aquatic classes was measured by the percentage of classes the participant attended during the 12-week program (M = 81.7%). The researchers randomly assigned 38 participants to the aquatic exercise or control group. The results indicated a significant

improvement in flexibility and strength. However, there was no indication of effects on physical function or pain in the aquatic exercise group.

Kim, Chung, Park, and Kang (2012) examined the effects of an aquatic exercise program using a combination of aquatic and aerobic exercise. The researchers randomly assigned 70 individuals diagnosed with osteoarthritis to an exercise or control group. The aquatic and aerobic exercise classes were scheduled three times a week over a 12-week period. The results indicated a significant decrease in pain, depression, and body weight. This contradicts earlier findings from Wang et al. (2007).

Segura-Jiménez et al. (2013) investigated the presence of immediate pain during and after an exercise program as well as change in pain levels prior to and after water-based exercises. The exercise program was offered two times a week over 12 weeks. They found significant improvements in older participants' pain level tolerance ($p = 0.005$), especially among those adults with more intense symptoms. This builds upon Lund et al.'s (2008) findings that indicated aquatic exercise can be effective in reducing pain with less adverse symptoms at follow up.

Fisken, Waters, Hing, Steele, and Keogh (2014) compared the effects of aquatic fitness, aquatic jogging, resisted aquatic fitness, resisted aquatic jogging, and hydrotherapy for 13 adults with osteoarthritis. The aquatic fitness regimen was offered two times a week over 9 weeks. In their findings, pain scores were significantly lower directly after the exercises were provided for all aquatic-based exercises.

Ansari, Elmieh, and Hojjati (2014) examined the effect of aquatic exercise on 30 men with knee osteoarthritis. Participants were randomly assigned to an exercise or control group. The aquatic exercises classes were offered three times a week over six weeks. The adults in the

aquatic exercise group reported significant improvement in pain, symptoms, motor performance, activities of daily living, and quality life.

Bressel, Wing, Miller, and Dolny (2014) examined the efficacy of aquatic treadmill exercise for 18 participants with knee osteoarthritis. The exercise sessions were scheduled 3 times a week over six weeks. Participants were first assigned to a control period followed by an exercise period. Results suggested significant improvements in pain, balance, function, and mobility due to exercise. This implies that aquatic exercise may be beneficial in pain management for individuals with arthritis.

Zgibor et al. (2016) examined the effects of the Arthritis Foundation Exercise Program (AFEP) and AFEP paired with an online training program. There were 416 participants enrolled in the study with a mean age of 73. The program was offered over 10 weeks and data was collected again at a six-month follow up. They noted that both groups had significant improvements in physical performance and arthritis outcomes such as pain, stiffness, and function. This strengthens the support for aquatic exercise being a very effective intervention in managing arthritis symptoms such as pain.

Aquatic and Land-Based Exercise

Assis et al. (2006) compared the effects of deep water running and land-based exercises on 60 women diagnosed with fibromyalgia. The researchers randomly assigned the women to the aquatic or land-based groups. The exercise groups were scheduled three times a week over 13 weeks. Adults in both groups noted significant improvement in pain by 36% ($p < 0.05$); however, only the deep water running group showed improvements in the emotional health survey ($p = 0.006$). This indicates that aquatic-based exercises may lead to significant

improvements in psychosocial well-being in addition to physical function when compared to land-based exercises.

Lund et al. (2008) also compared the effects of aquatic and land-based exercise on 79 adults with osteoarthritis. In this study, participants were randomly assigned to an aquatic, land-based exercise, or control group. Both exercise interventions were offered two times a week over eight weeks. A significant difference in pain reduction ($p = 0.039$) was reported for the exercise group. However, when compared to the exercise group, the aquatic exercise group noted significantly fewer adverse effects, such as discomfort, at follow up. This indicates that aquatic exercise may be beneficial in decreasing symptom severity and supports later findings by Segura-Jiménez et al. (2013).

Evcik, Yigit, Pusak, and Kavuncu (2008) examined the effects of aquatic and home-based exercise on 61 women diagnosed with fibromyalgia. The researchers compared data collected from each group at four different increments during the study. The exercise program was offered three times a week over five weeks. Participants were randomly assigned to either the aquatic or home-based exercise group. The researchers found a significant increase in functional capacity and quality of life with a decrease in pain for both exercise groups. A significant long-term decrease in pain was only observed in the aquatic exercise group.

The effects of aquatic and land-based exercises on chronic back pain was the focus of a study conducted by Dundar, Solak, Yigit, Evcik, and Kavuncu (2009). These researchers randomly assigned 65 participants to each group and collected data prior to and after treatment. The exercise program was scheduled five times a week over four weeks. The findings suggested significant improvement in pain, disability, and quality of life for both groups. However, there was a significantly greater improvement in pain and physical function within the aquatic exercise

group. This contradicts the findings by Wang et al. (2011). The researchers concluded that aquatic exercise is an effective pain management strategy for individuals.

Lim, Tchai, and Jang (2010) compared the effects of aquatic and land-based exercise programs on adults with osteoarthritis prior to and after the exercise programs. The researchers randomly assigned participants to the aquatic, land-based, or control group. The exercise program was offered three times a week over eight weeks. The results indicated that both groups significantly improved in disability when compared to the control group. However, the aquatic group significantly improved in pain and quality of life, while also reporting a significant decrease in body fat. The aquatic group reported a greater decrease in pain over the study period as well. This supports Evcik et al.'s (2008) findings that long-term improvements are observed after aquatic exercise interventions, but not necessarily in land-based exercise programs.

Wang et al. (2011) also compared the effects of aquatic and land-based exercise programs on adults with osteoarthritis. The researchers randomly assigned 84 participants to an aquatic, land-based, or control group. The exercise program was offered three times a week over 12 weeks. Adherence to the aquatic classes was measured by the percentage of classes the participant attended during the 12-week program (M = 86.5%). They reported significant interactions in pain within both exercise groups. Thus, they concluded that aquatic and land-based exercise programs can both be effective in reducing pain.

Bergamin and Tolomio (2013) compared the effects of an aquatic and land-based exercise program in 59 older adults. Participants were randomly assigned to an aquatic, land, or control group. Both exercise groups were offered two times a week over six months. They reported significant improvement in dynamic balance, leg strength, and fat mass within both exercise groups. However, only the aquatic group showed sustained significant improvements.

No significant difference was found between the aquatic and land-based exercise groups. This connects to later findings of Alkatan et al. (2016) that while there were no significant differences between groups, both exercises are valid when considering treatment for adults with arthritis.

Łyp et al. (2016) compared the effects of a rehabilitation program with added water exercises prior to and after hip replacement in 192 adults with arthritis. Participants were assigned to one of the four treatment groups or one of the two control groups (prior and after hip replacement). The rehabilitation programs were offered five times a week over three weeks. The study found a significant improvement in pain, range of motion, muscle strength, and medication use ($p < 0.001$) within the treatment group with water exercises added, both prior to and after hip replacement. This suggests that the addition of an aquatic exercise regimen to traditional rehabilitation exercises can assist in the reduction of pain and medication use among adults with arthritis.

Alkatan et al. (2016) compared the effects of swimming and cycling exercises on 48 older adults with osteoarthritis. Participants were randomly assigned to a swimming or cycling group. Exercise groups were scheduled three times a week over 12 weeks. Significant improvement in quality of life, joint pain, stiffness, and physical limitation ($p < 0.001$) was noted for both exercise groups. No significant differences between groups were found. This indicates that both aquatic and land-based exercise programs are beneficial in improving function in older adults.

The present research recommends an aquatic exercise program scheduled at least three times a week over a minimum of 12 consecutive weeks to reduce symptoms associated with arthritis. This research was based on several different aquatic exercise programs, which may provide different types of exercises and intensity of exercises. Therefore, more research is

needed to explore and identify the AFAP program specifically, and the effects it may have on pain for adults with arthritis and arthritis-related conditions.

APPENDICES

APPENDIX A: Full References

Alkatan, M., Baker, J. R., Machin, D. R., Park, W., Akkari, A. S., Pasha, E. P., & Tanaka, H. (2016). Improved function and reduced pain after swimming and cycling training in patients with osteoarthritis. *The Journal of Rheumatology, 43*(3), 666-672.

Ansari, S., Elmieh, A. R., & Hojjati, Z. (2014). Effects of aquatic exercise training on pain, symptoms, motor performance, and quality of life of older males with knee osteoarthritis. *Annals of Applied Sport Science, 2*(2), 29-38.

Assis, M. R., Silva, L. E., Alves, A. M., Pessanha, A. P., Valim, V., Feldman, D., De Barros Neto, T. L., Natour, J. (2006). A randomized controlled trial of deep water running: Clinical effectiveness of aquatic exercise to treat fibromyalgia. *Arthritis & Rheumatism, 55*(1), 57-65.

Arthritis Foundation. (n.d.). Arthritis facts. Retrieved November 07, 2017, from http://www.arthritis.org/about-arthritis/understanding-arthritis/arthritis-statistics-facts.php

Centers for Disease Control. (2017, March 14). Arthritis types. Retrieved from https://www.cdc.gov/arthritis/basics/types.html

Centers for Disease Control (2013, July 03). Prescription painkiller overdoses. Retrieved from https://www.cdc.gov/vitalsigns/prescriptionpainkilleroverdoses/index.html

Bamman, M. M., Wick, T. M., Carmona-Moran, C. A., & Bridges, S. L. (2016). Exercise medicine for osteoarthritis: Research strategies to maximize effectiveness. *Arthritis Care & Research, 68*(3), 288-291.

Belza, B., Topolski, T., Kinne, S., Patrick, D. L., & Ramsey, S. D. (2002). Does adherence make a difference?: Results from a community-based aquatic exercise program. *Nursing Research, 51*(5), 285–291.

Bennell, K. L., Dobson, F., & Hinman, R. S. (2014). Exercise in osteoarthritis: Moving from prescription to adherence. *Best Practice & Research Clinical Rheumatology, 28*(1), 93-117.

Bergamin, M., E., Tolomio, S., B., S., & Z. (2013). Water-versus land-based exercise in elderly subjects: Effects on physical performance and body composition. *Clinical Interventions in Aging,* 1109-1117.

Bressel, E., Wing, J. E., Miller, A. I., & Dolny, D. G. (2014). High-intensity interval training on an aquatic treadmill in adults with osteoarthritis: effect on pain, balance, function, and mobility. *Journal of Strength and Conditioning Research, 25*(8), 2088-2096.

Davis, J., & Nelson, R., (2015). Aquatic exercise for pain management in older adults with osteoarthritis. *Therapeutic Recreation Journal, 49*(4).

Dundar, U., Solak, O., Yigit, I., Evcik, D., & Kavuncu, V. (2009). Clinical effectiveness of aquatic exercise to treat chronic low back pain. *Spine, 34*(14), 1438-1440.

Ehrlich-Jones, L., Lee, J., Semanik, P., Cox, C., Dunlop, D., & Chang, R. W. (2011). Relationship between beliefs, motivation, and worries about physical activity and physical activity participation in persons with rheumatoid arthritis. *Arthritis Care & Research, 63*(12), 1700-1707.

Evcik, D., Yigit, I., Pusak, H., & Kavuncu, V. (2008). Effectiveness of aquatic therapy in the treatment of fibromyalgia syndrome: A randomized controlled open study. *Rheumatology International, 28*(9), 885-890.

Fisken, A., Keogh, J. W., Waters, D. L., & Hing, W. A. (2015). Perceived benefits, motives, and barriers to aqua-based exercise among older adults with and without osteoarthritis. *Journal of Applied Gerontology, 34*(3), 377-396.

Fisken, A., Waters, D. L., Hing, W. A., Steele, M., & Keogh, J. W. (2014). Perception and responses to different forms of aqua-based exercise among older adults with osteoarthritis. *International Journal of Aquatic Research and Education, 8*(1), 32-52.

Gusi, N., Tomas-Carus., Häkkinen, A., Häkkinen, K., & Ortega-Alonso, A. (2006). Exercise in waist-high warm water decreases pain and improves health-related quality of life and strength in the lower extremities in women with fibromyalgia. *Arthritis & Rheumatism, 55*(1), 66-73.

Hawker, G. A., Mian, S., Kendzerska, T., & French, M. (2011). Measures of adult pain: Visual Analog Scale for pain (VAS pain), Numeric Rating Scale for pain (NRS pain), McGill pain questionnaire (MPQ), Short-From McGill pain questionnaire (SF-MPQ), Chronic Pain Grade Scale (CPGS), Short From-36 Bodily Pain Scale (SF-36 BPS), and Measure of Intermittent and Constant Osteoarthritis Pain (ICOAP). *Arthritis Care & Research, 63*(S11), S240-S252.

Hinman, R. S., Heywood, S. E., & Day, A. R. (2007). Aquatic physical therapy for hip and knee osteoarthritis: Results of a single-blind randomized controlled trial. *Physical Therapy, 87*(1), 32-43.

Janke, M. C., Son, J. S., Jones, J. J., Payne, L. L., & Anderson, S. K. (2015). Leisure patterns and their associations with arthritis-related self-management and health. *Therapeutic Recreation Journal, 49*(4), 281-292.

Juhl, C., Christensen, R., Roos, E. M., Zhang, W., & Lund, H. (2014). Impact of exercise type and dose on pain and disability in knee osteoarthritis: A systematic review and meta-regression analysis of randomized controlled trials. *Arthritis & Rheumatology, 66*(3), 622-636.

Kim, I., Chung, S., Park, Y., & Kang, H. (2012). The effectiveness of an aquarobic exercise program for patients with osteoarthritis. *Applied Nursing Research, 25*(3), 181-189.

Knittle, K., Gucht, V. D., Hurkmans, E., Peeters, A., Ronday, K., Maes, S., & Vlieland, T. V. (2013). Targeting motivation and self-regulation to increase physical activity among patients with rheumatoid arthritis: A randomized controlled trial. *Clinical Rheumatology, 34*(2), 231-238.

Lim, J., Tchai, E., & Jang, S. (2010). Effectiveness of aquatic exercise for obese patients with knee osteoarthritis: A randomized controlled trial. *Physical Medicine & Rehabiliation, 2*(8), 723-731.

Lorig, K., Chastain, R. L., Ung, E., Shoor, S., & Holman, H. R. (1989). Development and evaluation of a scale to measure self-efficacy in people with arthritis. *Arthritis and Rheumatism, 32*(1), 34-44.

Lund, H., Weile, U., Christensen, R., Rostock, B., Downey, A., Bartels, E., … Bliddal, H. (2008). A randomized controlled trial of aquatic and land-based exercise in patients with knee osteoarthritis. *Journal of Rehabilitation Medicine, 40*(2), 137-144.

Łyp, M., Kaczor, R., Cabak, A., Tederko, P., Włostowska, E., Stanisławska, I., … Tomaszewski, W. (2016). A water rehabilitation program in patients with hip osteoarthritis before and after total hip replacement. *Medical Science Monitor, 22*, 2635-2642.

McCaffery, M., & Beebe, A., (1989). *Pain: Clinical manual for nursing practice.* St. Louis: Mosby.

Pendick, D. (2015, October 29). Report highlights the dangers of opioid painkillers. Retrieved March 30, 2017, from http://www.health.harvard.edu/blog/report-highlights-dangers-opioid-painkillers-201501157615

Scarpignato, C., Lanas, A., Blandizzi, C., Lems, W. F., Hermann, M., & Hunt, R. H. (2015). Safe prescribing of non-steroidal anti-inflammatory drugs in patients with osteoarthritis: An expert consensus addressing benefits and gastrointestinal as well as cardiovascular risks. *BMC Medicine, 13*(1), 1-22.

Segura-Jiménez, V., Carbonell-Baeza, A., Aparicio, V. A., Samos, B., Femia, P., Ruiz, J. R., & Delgado-Fernández, M. (2013). A warm water pool-based exercise program decreases immediate pain in female fibromyalgia patients: Uncontrolled clinical trial. *International Journal of Sports Medicine, 34*(7), 600-605.

Sessford, J. D., Brawley, L. R., Cary, M. A., Flora, P. K., Blouin, J. E., Meade, L.… Gyurcsik, N. C. (2017). Self-regulatory efficacy encourages exercise persistence despite arthritis flare symptoms. *Applied Psychology: Health and Well-Being,* 9, 285-302.

Stitik, T. P., Foye, P. M., Stiskal, D., & Nadler, R. R. (2005) Osteoarthritis. In J. A. DeLisa, B. M. Cans, & N. E. Walsh (Eds), Physical Medicine and Rehabilitation: Principles and Practices (4th Edition). Lippincott Williams & Wilksin: Philadelphia, PA.

Walsh, D. A., & McWilliams, D. F. (2012). Pain in rheumatoid arthritis. *Current Pain and Headache Reports, 16*(6), 509-517.

Wang, T., Lee, S., Liang, S., Tung, H., Wu, S. V., & Lin, Y. (2011). Comparing the efficacy of aquatic exercises and land-based exercises for patients with knee osteoarthritis. *Journal of Clinical Nursing, 20*(17-18), 2609-2622.

Wang, T., Thompson, F. E., Whitney, J. D., & Bennett, K. (2007). Effects of aquatic exercise on flexibility, strength and aerobic fitness in adults with osteoarthritis of the hip or knee. *Journal of Advanced Nursing, 57*(2), 141-152.

Yoon, E., & Doherty, J. B. (2008). Chapter 4; Arthritis Pain. *Journal of Gerontological Social Work*, *50*(Sup1), 79-103.

Zgibor, J. C., Ye, L., Boudreau, R. M., Conroy, M. B., Bilt, J. V., Rodgers, E. A., ... Newman, A. B. (2016). Community-based healthy aging interventions for older adults with arthritis and multimorbidity. *Journal of Community Health*, *42*(2), 390-399.

APPENDIX B: Self-Report Form

Vidant Wellness Center
2016 Aquatic Arthritis Program

VIDANT

Participant Self Report Form

Name: _____ **Date of Birth:** _____ **Age:** _____

Height: _____ **Current Weight:** _____ lbs. **Today's Date:** ____/____/____

Medical History / Risk Factors
(Check all that apply)

O Diabetes
O Gestational Diabetes
O Heart disease
O High Blood pressure
O High Cholesterol
O Stroke
O Gastric bypass
O Thyroid problems
O Other:

List **ALL** Medications:
O
O
O
O

Over the counter medications, supplements, vitamins, herbs, etc.:
O
O
O
O

Typical Dietary Schedule

Meals / day
O 1
O 2
O 3
O 4

Snacks / day
O None
O 1
O 2
O 3

Times you eat out / pick up food not prepared at home?
O Rare
O 1-3 per week
O 4-6 per week
O 7+ per week

How often do you skip meals?
O 1 -2 per day
O 1-2 per week
O Rarely or almost never

How many hours do you sleep each night? _____

Beverage Choices
(Check all that apply)

Beverages you drink regularly:

Daily oz. Consumed:

O Water _____
O Coffee _____
O Juice _____
O Whole Milk _____
O 2% Milk _____
O 1% Milk _____
O Skim Milk _____
O Regular Soda _____
O Diet soda _____
O Sweet tea _____
O Unsweet tea _____
O Alcohol _____
O Other: _____

Substance Use

Cigarette or use tobacco use:
O None
O Regular Use
O Quitting or recently quit

Alcohol use:
O None
O Regular Use
O Quitting or recently quit

Drug use:
O None
O Amphetamines
O Barbiturates
O Other:

Physical Activity Habits

Aerobic / Cardiovascular exercise:
O Never / Rare
O 1-2 times per week
O 3-4 times per week
O 5-7 times per week

Weights / Strength training:
O Never / Rare
O 1-2 times per week
O 3-4 times per week
O 5-7 times per week

Chronic Pain Conditions
(Check all that apply)

*Avg. Pain Level:

O Neck Pain _____
O Back Pain _____
O Spinal Stenosis _____
O Leg / Hip Pain _____
O Pinched Nerve _____
O Joint Pain _____
O Inflammatory Pain _____
O Degeneration _____
O Neuropathic Pain _____
O Other: _____

(*0 = No Pain / 10 = Intolerable Pain)

APPENDIX C: Weekly Schedule

Vidant Wellness Center - Greenville Aquatics Exercise **May 2017 (Eastern Time)**

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	1 7:45am - Aquatic 8:30am - Cardio Power 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Hydro Challenge 6pm - Yo-Pi-Chi Plus @	2 6am - Pumping H20 @ 8am - Cardio Power @ 9am - Aqua Flex and 10am - Easy Does It @ 11am - Aquatic Arthritis 12pm - Aquatic Pain 5:30pm - Aquatic 5:30pm - Dyanmic	3 7:45am - Aquatic 8:30am - Arms and Abs 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Arms and Abs @ 6pm - Aqua Jam (Youth)	4 6am - Pumping H20 @ 8am - Cardio Power @ 9am - Yo-Pi-Chi Plus @ 10am - Easy Does It @ 11am - Aquatic Arthritis 12pm - Aquatic Pain 5:30pm - Aquatic 5:30pm - Hydro	5 7:45am - Aquatic 8:30am - Cardio Power 9:30am - Water Works 10am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis	6 8:30am - Weekend 9:30am - Yo-Pi-Chi @
7	8 7:45am - Aquatic 8:30am - Cardio Power 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Hydro Challenge 6pm - Yo-Pi-Chi Plus @	9 6am - Pumping H20 @ 8am - Cardio Power @ 9am - Aqua Flex and 10am - Easy Does It @ 11am - Aquatic Arthritis 12pm - Aquatic Pain 5:30pm - Aquatic 5:30pm - Dyanmic	10 7:45am - Aquatic 8:30am - Arms and Abs 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Arms and Abs @ 6pm - Aqua Jam (Youth)	11 6am - Pumping H20 @ 8am - Cardio Power @ 9am - Yo-Pi-Chi Plus @ 10am - Easy Does It @ 11am - Aquatic Arthritis 12pm - Aquatic Pain 5:30pm - Aquatic 5:30pm - Hydro	12 7:45am - Aquatic 8:30am - Cardio Power 9:30am - Water Works 10am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis	13 8:30am - Weekend 9:30am - Yo-Pi-Chi @
14	15 7:45am - Aquatic 8:30am - Cardio Power 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Hydro Challenge 6pm - Yo-Pi-Chi Plus @	16 6am - Pumping H20 @ 8am - Cardio Power @ 9am - Aqua Flex and 10am - Easy Does It @ 11am - Aquatic Arthritis 12pm - Aquatic Pain 5:30pm - Aquatic 5:30pm - Dyanmic	17 7:45am - Aquatic 8:30am - Arms and Abs 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Arms and Abs @ 6pm - Aqua Jam (Youth)	18 6am - Pumping H20 @ 8am - Cardio Power @ 9am - Yo-Pi-Chi Plus @ 10am - Easy Does It @ 11am - Aquatic Arthritis 12pm - Aquatic Pain 5:30pm - Aquatic 5:30pm - Hydro	19 7:45am - Aquatic 8:30am - Cardio Power 9:30am - Water Works 10am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis	20 8:30am - Weekend 9:30am - Yo-Pi-Chi @
21	22 7:45am - Aquatic 8:30am - Cardio Power 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Hydro Challenge 6pm - Yo-Pi-Chi Plus @	23 6am - Pumping H20 @ 8am - Cardio Power @ 9am - Aqua Flex and 10am - Easy Does It @ 11am - Aquatic Arthritis 12pm - Aquatic Pain 5:30pm - Aquatic 5:30pm - Dyanmic	24 7:45am - Aquatic 8:30am - Arms and Abs 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Arms and Abs @ 6pm - Aqua Jam (Youth)	25 6am - Pumping H20 @ 8am - Cardio Power @ 9am - Yo-Pi-Chi Plus @ 10am - Easy Does It @ 11am - Aquatic Arthritis 12pm - Aquatic Pain 5:30pm - Aquatic 5:30pm - Hydro	26 7:45am - Aquatic 8:30am - Cardio Power 9:30am - Water Works 10am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis	27 8:30am - Weekend 9:30am - Yo-Pi-Chi @
28	29 7:45am - Aquatic 8:30am - Cardio Power 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Hydro Challenge 6pm - Yo-Pi-Chi Plus @	30 6am - Pumping H20 @ 8am - Cardio Power @ 9am - Aqua Flex and 10am - Easy Does It @ 11am - Aquatic Arthritis 12pm - Aquatic Pain 5:30pm - Aquatic 5:30pm - Dyanmic	31 7:45am - Aquatic 8:30am - Arms and Abs 9:30am - Water Works 10am - Aquatic Arthritis 11am - Aquatic Arthritis 12pm - Aquatic Arthritis 1pm - Aquatic Arthritis 5pm - Arms and Abs @ 6pm - Aqua Jam (Youth)	1	2	3

APPENDIX D: General Lesson Plan

TABLE 5.1 GENERAL LESSON PLAN

CLASS STRUCTURE AND COMPONENTS	TIME FRAME
WELCOME & HEALTH EDUCATION Welcome participants. Select & share one Sample Health Education Topic, or create your own Health Education Topic. NOTE: Welcome may be included as part of the Warm-Up. NOTE: Health Education may be included as part of the Warm-Up or at any point during the class, even at multiple times during class.	1-2 minutes AFAP – while walking to prevent chilling
ANNOUNCEMENTS Example: Share the date of the local Arthritis Walk, or remind participants about a class-related social event. NOTE: Announcements may be included as part of the Warm-Up.	<1 minute AFAP – while walking to prevent chilling
OVERALL GOALS FOR THE CLASS Example: "Today we will be focusing on balance, posture and proper breathing." NOTE: Overall Goals may be included as part of the Warm-Up.	<1 minute AFAP – while walking to prevent chilling
WARM-UP NOTE: Include any of the components above during the Warm-Up exercises and activities, or select one Sample Warm-Up/Cool-Down found, or design your own warm-up following the samples as a guideline.	5-10 minutes
FLEXIBILITY & ROM Utilize exercises from Category **I**. Select 1-4 exercises from various subcategories to target the full body: - Neck & Jaw, Shoulder & Elbow, Wrist & Finger, Trunk, Hip & Knee, Ankle & Toes.	5-10 minutes
MUSCULAR STRENGTH & ENDURANCE Utilize exercises from Category **I**. Select 1-3 exercises from various subcategories as appropriate for your class: - AFAP – Shoulder & Elbow, Trunk, Hip & Knee. Add recommended equipment where appropriate. - AFEP – Shoulder & Elbow; Trunk; Hip & Knee; Optional Floor Exercises; Exercises with Resistance Bands, Loops & Tubing; Exercises with Weights.	5-10 minutes
CARDIORESPIRATORY ENDURANCE Utilize exercises from Category **II**. Select 1-3 exercises from various subcategories as appropriate for your class: - AFAP – Cardiorespiratory Endurance Exercises, Optional Deep-Water Exercises. Or select from sample AFAP Cardio Combinations. - AFEP – Walking Combinations, Dance Steps, Sports Theme Activities, Fun Activities. Or select from sample Cardio Combos.	AFAP Basic: 1-5 minutes AFAP Plus & AFEP: 5-20 minutes
BALANCE & COORDINATION Choose exercises from Category **II**, Subcategory Balance Activities.	1-5 minutes
OPTIONAL ACTIVITIES Choose exercises from Category **IV** as time allows and as appropriate for your class.	0-10 minutes
COOL-DOWN & RELAXATION Choose stretches and/or relaxation options from Category **III**.	5-10 minutes
CLOSING Example: Discuss a Health Education Topic, share a thought for the day, or distribute an Arthritis Foundation handout/brochure	<1 minute
HOMEWORK (OPTIONAL) Encourage participants to take the information from class and apply to a healthy lifestyle. Example: Suggest that participants practice a breathing technique during two TV commercials each evening, select an exercise (such as FINGER O) to do each day when not in class, or do GLUTEAL SET at each stop light when driving or riding in the car.	<1 minute

APPENDIX E: Numeric Pain Rating Scale

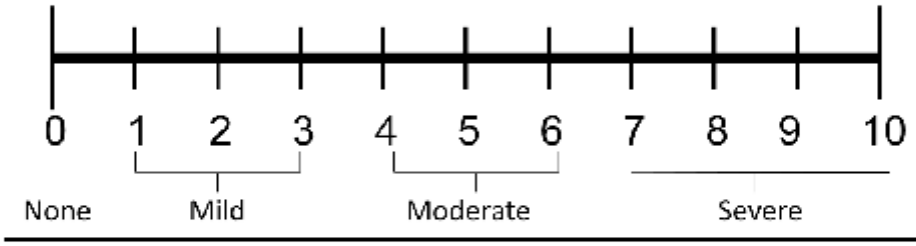
The Numeric Pain Rating Scale Instructions

General Information:

- The patient is asked to make three pain ratings, corresponding to current, best and worst pain experienced over the past 24 hours.
- The average of the 3 ratings was used to represent the patient's level of pain over the previous 24 hours.

Patient Instructions (adopted from (McCaffery, Beebe et al. 1989):

"Please indicate the intensity of current, best, and worst pain levels over the past 24 hours on a scale of 0 (no pain) to 10 (worst pain imaginable)"



Reference:

McCaffery, M., Beebe, A., et al. (1989). Pain: Clinical manual for nursing practice, Mosby St. Louis, MO.

APPENDIX F: Added Self-Report Questions

1. How often do you attend arthritis classes at VWC during a typical a month? (Classes attended)
2. How long have you been attending arthritis classes at VWC? (Months)

APPENDIX G: Self-Report Survey

Self-Report Survey

Age:
Height:
Current Weight:

1. How much of your pain is related to your arthritis?
    a. Extremely related
    b. Somewhat related
    c. Neutral

2. Are there any significant changes in health status that affect your pain level? (Check all that apply)

- Diabetes
- Gestational diabetes
- Heart Disease
- High blood pressure
- High cholesterol
- Stroke gastric bypass
- Thyroid problems
- Other:

3. Chronic Pain Conditions (Check all that apply)

Average pain level:

- Neck pain
- Back pain
- Spinal Stenosis
- Leg/Hip pain
- Pinched nerve
- Joint pain
- Inflammatory pain
- Degeneration
- Neuropathic pain
- Other:

(0 = no pain, 10 = intolerable pain)

4. What other pain relief measures have you started since intake? (Medications, other exercise programs, wearing orthotics)

5. How often do you attend arthritis classes at VWC during a typical month? (Classes attended)

6. How long have you been attending arthritis classes at VWC? (Months)

APPENDIX H: Informed Consent Form

East

CarolinaUniversity

Informed Consent to Participate in Research
Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Aquatic exercise and pain management: An examination of the effects of frequency and duration of participation on older adults with arthritis

Principal Investigator:
Institution, Department or Division: East Carolina University
Telephone #: 910-336-7903

Researchers at East Carolina University (ECU) study issues related to society, health problems, environmental problems, behavior problems and the human condition. To do this, we need the help of volunteers who are willing to take part in research.

Why am I being invited to take part in this research?
The purpose of this research is to examine the effects of frequency and duration of a standardized aquatic exercise program on the pain levels of older adults with arthritis. You are being invited to take part in this research because you are enrolled in specialty aquatics arthritis classes at Vidant Wellness Center. The decision to take part in this research is yours to make. By doing this research, we hope to learn if aquatic exercise predicts change in pain levels of people with arthritis.

If you volunteer to take part in this research, you will be one of about 50 people to do so.

Are there reasons I should not take part in this research?
I understand I should not volunteer for this study if I am, under 18 years of age, or I have not been enrolled in aquatics classes with Vidant Wellness Center.

What other choices do I have if I do not take part in this research?
You can choose not to participate.

Where is the research going to take place and how long will it last?
The research will be conducted at Vidant Wellness Center. You will need to come to a private conference room to complete the survey once during the study. The total amount of time you will be asked to volunteer for this study is 5 minutes.

What will I be asked to do?

You will be asked to do the following:
Complete a survey concerning questions related to demographic information, pain level, and your average levels of frequency and duration of participation in aquatic exercise. Once data collection is complete, all paper surveys will be shredded.

What might I experience if I take part in the research?
We don't know of any risks (the chance of harm) associated with this research. Any risks that may occur with this research are no more than what you would experience in everyday life. We don't know if you will benefit from taking part in this study. There may not be any personal benefit to you but the information gained by doing this research may help others in the future.

Will I be paid for taking part in this research?
We will not be able to pay you for the time you volunteer while being in this study.

Will it cost me to take part in this research?
It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?
ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:
Any agency of the federal, state, or local government that regulates human research. This includes the Department of Health and Human Services (DHHS), the North Carolina Department of Health, and the Office for Human Research Protections.
The University & Medical Center Institutional Review Board (UMCIRB) and its staff have responsibility for overseeing your welfare during this research and may need to see research records that identify you.
People designated by Vidant Wellness Center.

How will you keep the information you collect about me secure? How long will you keep it?
Data will be kept for the duration of data collection and entry, lasting approximately two weeks. Once data collection is complete, paper surveys will be stored in a locked office on East Carolina University's campus. Once data is entered, paper surveys will then be shredded and electronic data will be stored on a password-protected computer located on East Carolina University's campus.

What if I decide I don't want to continue in this research?
You can stop at any time after it has already started. There will be no consequences if you stop and you will not be criticized. You will not lose any benefits that you normally receive.

Who should I contact if I have questions?
The people conducting this study will be able to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at 910-336-7903.

If you have questions about your rights as someone taking part in research, you may call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the ORIC, at 252-744-1971 and the Vidant Medical Center Risk Management Office at 252-847-5246.

I have decided I want to take part in this research. What should I do now?
The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

I have read (or had read to me) all of the above information.
I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
I know that I can stop taking part in this study at any time.
By signing this informed consent form, I am not giving up any of my rights.
I have been given a copy of this consent document, and it is mine to keep.

_____ _____

Participant's Name (PRINT) **Signature** **Date**

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person's questions about the research.

_____

Person Obtaining Consent (PRINT) **Signature** **Date**

APPENDIX I: IRB Approval Letter

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** · **www.ecu.edu/ORIC/irb**

Notification of Initial Approval: Expedited

From: Biomedical IRB
To: Lauren Gregg
CC: Megan Janke

Date: 9/11/2017
Re: UMCIRB 17-001419
Aquatic exercise and pain management: An examination of the effects of frequency and duration of participation on older adults with arthritis

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 9/8/2017 to 9/7/2018. The research study is eligible for review under expedited category #5,7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
Gregg_ApplicationforWaiverForm.doc	HIPAA Authorization
Gregg_InformedConsentNoMoreThanMinimalRisk.doc	Consent Forms
Gregg_Proposal.docx	Study Protocol or Grant Application
Gregg_Survey.docx	Surveys and Questionnaires

The Chairperson (or designee) does not have a potential for conflict of interest on this study.