2000

Efficacy of an aquatic movement program for individuals with arthritis

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EFFICACY OF AN
AQUATIC MOVEMENT PROGRAM
FOR INDIVIDUALS WITH ARTHRITIS

by

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An Abstract

of a thesis in partial fulfillment of the

requirements for the degree of Master of Science

in the School of Health Sciences and Human Performance at

Ithaca College

June 2000

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Abstract

This study was conducted to determine the effectiveness of an aquatic movement program for individuals with arthritis. The Arthritis Foundation YMCA Aquatic Program's (AFYAP) guidelines and procedures were used to structure a six week aquatic movement program at Longview, a senior citizen residential community in Ithaca, New York.

Participants in the experimental group attended two classes per week, each lasting 45 minutes to an hour. Each class followed the same basic format of aquatic movement, which included walking, deep breathing, and range of motion (ROM) exercises for the neck, trunk, upper extremity, and lower extremity. The twelve participants in the experimental group were instructed to perform the range of motion exercises slowly and within a comfortable range.

A control group of nine individuals was recruited from the residents of Longview who had arthritis, but were not engaged in an aquatic exercise program.

Both the members of the control group and the members of the experimental group were asked to complete the Arthritis Impact Measurement Scales 2 (AIMS2) as a pre and posttest measure. The AIMS2 is a self-report questionnaire that includes questions about mobility level, walking and bending, hand and finger functioning, arm function, ability to perform self-care tasks, household tasks, engagement in social activity, support from family and friends, arthritis pain, work, level of tension and mood. The questions are compiled to develop five health status components, including physical, affect, symptom, social interaction, and role.

The first four health status components were used to develop four null hypotheses: that there is no significant difference in an individual with arthritis's (1) physical functioning during daily activities, (2) pain, (3) affect, nor (4) social interaction after engaging in an aquatic movement program. The null hypotheses were analyzed, using the SPSS computer statistical analysis program and paired t-tests were performed.

There was no significant difference between pre and posttest scores for the experimental and the control groups with respect to physical functioning, pain, and social interaction. However, there was a marginally significant difference for the affect component for the exercise group ($t(9)=2.067$, $p=.069$), which improved after engaging in the AFYAP.

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A Thesis Presented to the Faculty

Of the School of Health Science and Human Performance

Ithaca College

In Partial Fulfillment of the

Requirements for the Degree

Masters of Science

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by

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June 2000

Ithaca College

School of Health Science and Human Performance

Ithaca, New York

CERTIFICATE OF APPROVAL

This is to certify that the Thesis of

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Submitted in partial fulfillment of the requirements for the degree of
Master of Science in the Department of Occupational Therapy, School of Health Science and Human Performance at Ithaca College has been approved.

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Date: November 17, 2000

Acknowledgements

I would like to thank the Department of Occupational Therapy faculty who have helped contribute to the completion of this thesis, with a special thank you to Carol Knight, thesis advisor, Carole Dennis, Dr. Gordon, and Heidi Holmes of the Gerontology Institute for her statistical expertise.

Dedication

To my parents and fiancé David who have supported me throughout my time at Ithaca College.

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Chapter 1: Introduction

Background

Forty million people in the United States of America had arthritis in 1995; this is equivalent to approximately one in six Americans (Arthritis Foundation, 1999). This figure is expected to jump to 59.4 million Americans in 2020 as projected by the Centers for Disease Control and Prevention (CDC) (Arthritis Foundation, 1999). Therefore, approximately 20 percent of the population will have arthritis (Arthritis Foundation, 1999).

Arthritis is also the leading cause of disability of Americans over the age of fifteen years (Arthritis Foundation, 1999). Since so many Americans are affected by arthritis, this set of diseases has a large impact on the health care system. These individuals require extended medical attention, and some are unable to maintain employment as a result of their disease. For these reasons, arthritis influences our national economy. A "1992 study found that arthritis costs the nation $65 billion each year – approximately 1.1 percent of the gross national product and equal to a moderate recession" (Sammons, 1999, p. 1).

Often people experience pain and decreased active and passive range of motion (ROM), which can lead to decreased strength and endurance because individuals usually stop performing their normal activities or daily occupations due to the pain. Decreased involvement or participation in one's daily occupations can lead to decreased self-esteem, decreased social interaction, and decreased emotional well being. Occupational therapy can assist an individual in increasing his or her level of daily functioning.

Maintenance of movement and active and passive range of motion (ROM) are the main foci for preserving function and preventing secondary effects of arthritis. However, the pain an individual with arthritis experiences may limit exercising on the land. There are several properties of water that make aquatic movement exercises less painful, easier and more beneficial for an individual with arthritis. Buoyancy is one of these properties. Buoyancy is the upward force water exerts against a body immersed. Buoyancy can assist, resist, or support movement. Buoyancy assists motions of the extremities and/or trunk as those parts are moved toward the

surface. Buoyancy also helps to decrease the impact of quick motions on joints by supporting the limbs. The force of buoyancy resists movement when the extremity and/or trunk is pushed away from the surface during an exercise. This resistance can help to increase strength and endurance.

The heat of the water is an additional property that may benefit someone with arthritis. Movements preformed in warm water increase the blood flow in the body, which in turn, increases the transport of minerals throughout the body. Heat decreases the viscosity of structures, which decreases edema and facilitates softening of scar tissue. As explained by the Arthritis Foundation, "the warmth and buoyancy of water can help decrease pain and/or stiffness and help improve or maintain joint flexibility" (Guidelines and Procedures Manual, 1996, p. 2). The Arthritis Foundation states that for aquatic movement programs for individuals with arthritis, the water should be a minimum of 83°F. This temperature is not warmer than body temperature, therefore it may not be acting as a warm medium. McArdle, Magel, Spina, Gergley, and Toner (1984) conducted a study which recorded men and women's body temperature while exercising in water 82.4°F and found the participants' body temperature remained about the same as their temperature was prior to exercising in the water. The Arthritis Foundation also states that temperatures 83°F and above facilitates relaxation. However, there is no definitive research that states the proper pool temperature and the effects of the temperature on the body.

The Arthritis Foundation Young Men's Christian Association (YMCA) Aquatic Program (AFYAP) was established in the early 1980's and has been recently updated. The program is held in many YMCAs across the country. This program "consists of 68 range-of-motion and muscle strengthening exercises and an optional endurance segment lasting up to a maximum of five to 10 minutes" (Arthritis Foundation, 1996, p. 1). The AFYAP, with its extensive list of guidelines and procedures, is a good example of a structured aquatic program for individuals with arthritis.

Little research has been conducted on the efficacy of aquatic programs to improve the function of people with arthritis. In 1985-1986, the Arthritis Foundation (1996) surveyed 60 randomly selected AFYAP class participants. After attendance in at least six weeks of AFYAP classes, the participants reported significant positive differences in their ability to perform activities of daily living and in their pain level. A current study of the efficacy of the revised AFYAP program is needed.

Statement of the Problem

Since prevalence of arthritis is large and still growing, it is the responsibility of the health care system to control the expense of treatment for these individuals by identifying the most cost effective and efficient treatment. Aquatic movement programs are a recommended treatment modality for individuals with arthritis because of the beneficial properties of the water. Health insurance funding for such programs could potentially decrease health care costs. However, insurers may be reluctant to pay for unproven services, particularly those outside of traditional medical practice. Research to determine the effectiveness of aquatic movement programs for the treatment of people with arthritis in terms of health related quality of life benefits may encourage medical reimbursement.

Rationale/Significance

Arthritis is a disease process that affects many individuals and has a huge influence on our economy and the health care system, costing the nation $65 billion in 1992 (Sammons, 1999). Since approximately 40 million lives are affected by arthritis (Arthritis Foundation, 1999), it would appear that the health care system should be concerned with developing and determining the most effective and cost efficient way to improve the quality of life for these individuals. Aquatic programs may beneficially address the needs of individuals with arthritis, which include symptom management, prevention, and improving daily functioning. As Leanne Marlier, a physical therapist and director of ambulatory care at "Back To Work" in Simi Valley, California, stated

> "aquatic therapy allows a rehab provider to address the multiple medical needs of arthritics but with far great efficiency and efficacy than would be the case using conventional land-based treatment ... this is especially important in light of payor limitations on visits and reimbursement where land-based therapy is concerned" (Smith, 1997, p. 54).

The increase in the number of individuals affected by arthritis in 2020 is projected by the CDC to be 59.4 million Americans (Arthritis Foundation, 1999) and the concomitant increase in national health care costs, make it imperative that cost effective methods to manage arthritic symptoms are established.

Definition of Terms

AFYAP: (Arthritis Foundation YMCA Aquatic Program) A five-week group exercise program performed in a heated pool. The instructors are trained and follow a protocol outlined by AFYAP. Specific exercises are performed that have been approved by the program.

Arthritis: "Inflammation of a joint usually accompanied by pain, swelling, and, frequently, changes in structure" (Thomas, 1997, p. 150). The Arthritis Foundation describes arthritis as

> a serious disease that causes pain and loss of movement. It affects the movements you rely on for everyday activities. Arthritis is usually chronic, meaning it can last on and off for as long as a lifetime. There are over 100 kinds of arthritis, which can affect many different parts of the body. Joints are most often affected (Arthritis Foundation Central New York Chapter [brochure]).

Quality of Life: The degree of wellness, which includes physical, social, and emotional aspects of an individual, so that the individual is able to accomplish necessary and desired tasks or occupations.

Treatment: A program developed in collaboration with the individual to improve or lessen and prevent the effects of a disease process to improve quality of life.

Cure: To eliminate the presence of a disease in an individual; to remove all signs and symptoms of the disease.

Buoyancy: The upward force water applies to an object.

Occupation: The engagement in self-care and maintenance, work, play, and leisure tasks or activities (Trombly, 1995).

Purpose of the Study

The purpose of this study is.to determine the benefits of an aquatic movement program for individuals with arthritis in terms of the impact of arthritis on the participant's physical functioning during daily activities, pain, affect, and social interaction.

Efficacy of an Aquatic Movement Program for Individuals with Arthritis

Chapter 2: Review of Literature

Introduction

Arthritis is the generic term for a group of diseases that affect single or multiple joints in one's body. The Greek word *arth* means joint and *itis* can be translated into inflammation or infection (Lorig & Fries, 1995). Arthritis means the inflammation of a joint. Much research has been conducted to find a treatment or a cure, significant treatments have been developed, but a cure eludes medical science. Prevention of progression and management of the disease process to prevent disabling pain and deformity is currently possible.

Aquatic exercise is a suggested treatment modality for individuals with arthritis. Leanne Marlier, a physical therapist who is the director of ambulatory care at Back To Work Physical Therapy in Simi Valley, California is quoted: "'aquatic therapy allows a rehab provider to address the multiple medical needs of arthritics but with far greater efficiency and efficacy than would be the case using conventional land-based treatment'" (Smith, 1997, p. 54).

Inflammation Process

Arthritis is the inflammation of one or multiple joints. Inflammation is considered to be the response of a tissue to an irritant (Salter, 1983).

Inflammation causes the following manifestations: redness, swelling, heat, and pain (Salter, 1983). Loss of function can also be included in this list because swelling and pain may decrease the amount, duration, and type of activities an individual can perform. Blood vessels dilate in the area of the irritant and this causes the redness and the heat. The area swells because the body releases an exudate (or pus) because the hydrostatic pressure and capillary permeability is increased in the affected area. The most amount of pain is usually experienced during the acute stages of the inflammation process. Pain is mostly associated with the increased pressure in the inflamed area. As stated by Salter (1983), "the initial loss of function of the involved part is due to pain and swelling; however, subsequent loss of function may result from a combination of actual destruction of tissue, such as articular cartilage, and dense scar formation in soft tissues" (p. 168).

Arthritis Classification

The term arthritis encompasses over 120 different types. One or more of the structures of the joints may be involved. The three most common forms of arthritis are RA, OA, and fibromyalgia (Lorig & Fries, 1995). In the arthritic process of the primary types of arthritis, different components of the joint are involved. Synovitis, or inflammation of the synovial membrane, is present in rheumatoid arthritis (RA) (Lorig & Fries, 1995). Osteoarthritis (OA) is caused by deterioration of the joint cartilage. Fibromyalgia results in chronic muscle soreness.

Rheumatoid Arthritis

The course of RA varies widely, however it is usually chronic in nature and is marked with periods of exacerbations and remissions of pain and swelling of the joints. It is during the exacerbations that the structures of the joint are most vulnerable to damage, which may in turn lead to disability and deformity. RA is a "systemic disease of connective tissue" (Salter, 1983, p. 191). People with RA may experience a few or all of the following problems to varying degrees: malaise, fatigue, fever, weight loss, anemia, muscle atrophy, and joint deformities (Salter, 1983). The onset of the disease is most commonly between ages 20 and 40, but may occur at any age. Typically, the peripheral joints of the limbs are affected first and symmetrically.

The etiology of RA is unknown. Some feel that a microorganism causes the disease, however there are additional variables to consider. The *rheumatoid factor*, a macroglobulin, is present in 70% of the people with RA (Salter, 1983). However, this factor is also present in individuals who do not have RA, but have a different connective tissue disease. This suggests that the rheumatoid factor may develop in an individual with RA, and not cause RA. Psychological factors have also been considered as a predisposing factor, while others feel that the psychological traits are a response to the disease. Salter (1983) stated, "however, the current consensus is that these psychological or personality traits are an understandable reaction to the disease, i. e. an effect, or result rather than a factor in its cause" (p. 192).

The synovial membrane of the joints and the sheaths that the tendons run through are the destructive focus of the disease. When the synovium becomes inflamed, a pannus, which is a hard granulamatous mass, develops over the surface of the articular cartilage and into and around the tendons. The joint capsule and the ligaments are also involved during the inflammatory phase, which causes weakening of the joint stability and possibly subluxation.

RA affects about twenty million people worldwide and about three-quarters of these individuals are women. RA has been medically diagnosed for approximately two hundred years, but skeletal remains suggest that thousands of years may be a more accurate estimate of the presence of this disease in human beings (Lorig & Fries, 1995). However, Robert B. Salter, M. D. (1983) does not completely agree with this comment, he stated that "Buchanan has stated that while there is good historical evidence that degenerative joint disease (osteoarthritis) has afflicted man for at least 40,000 years, and probably much longer, rheumatoid arthritis would seem to have appeared as a relatively new disease in man only 200 years ago" (p. 191).

Osteoarthritis

OA is synonymous with degenerative joint disease. It "is a slow, progressive degeneration of joint structures which can lead to loss of mobility, chronic pain, deformity, and loss of function" (Goodman & Boissonnault, 1998, p. 660). The prevalence of OA increases with age. The majority of the individuals who develop OA before the age of 45 are men; however, women comprise a larger percentage of the OA population in older age. Goodman and Boissonnault (1998) stated that "it is estimated that 60% to 85% of the population aged 60 years and older have some degree of articular cartilage damage in a number of joints" (p. 660). There are two types of osteoarthritis, primary and secondary.

Primary OA is more common among women (Salter, 1983). This disease usually appears in middle age. Primary OA mimics the typical aging of joints, but it occurs at an accelerated rate. Many joints are involved in this type of disease and the etiology is unknown. Overuse and abuse

of the joints hasten the degenerative process of the joints. Obesity intensifies the degenerative process in weight-bearing joints (Salter, 1983).

The secondary type of osteoarthritis is more common in males (Salter, 1983). This type is caused by articular cartilage damage resulting from an injury, deformity, or disease. This process frequently occurs in weight-bearing synovial joints and in the intervertebral joints of the lumbar spine due to the everyday "wear and tear" on these joints (Salter, 1983).

Osteoarthritis is also enhanced by normal age related bodily changes. With age, the hyaline cartilage, a non-regenerative tissue that covers the ends of bones becomes old, yellow, and dull. The shock absorbing proteoglycans within the hyaline cartilage begin to deteriorate. The muscles must then absorb shock to the joints during everyday activities, such as walking, vacuuming, and performing leisure activities like tennis. This can cause fatigue because muscles are performing added work; not only are they contracting and relaxing to perform desired movements to accomplish tasks, but they must also act as shock absorbers.

Fibromyalgia

Fibromyalgia is a systemic disease, and is often mislabeled and misdiagnosed (Goodman & Boissonnault, 1998). An individual with fibromyalgia experiences chronic muscle pain of unknown cause and cure. As Goodman and Boissonnault (1998) expressed, "fibromyalgia is associated with a variety of initiating or perpetuating factors such as psychologically distressing events, primary sleep disorders, inflammatory rheumatic arthritis, and acute febrile illness" (p. 115).

The prevalence of fibromyalgia is now greater than that of rheumatoid arthritis (Goodman & Boissonnault, 1998). Women comprise 75% to 80% of the individuals diagnosed with fibromyalgia. Goodman and Boissonnault (1998) state, "risk factors or triggering events for the onset of fibromyalgia may include anxiety and emotional stress, trauma..., rapid steroid withdrawal, hyperthyroidism, and viral and nonviral infections" (p. 115). Fibromyalgia is more prevalent in individuals who are less physically fit. Little is known of the cause of fibromyalgia;

it is probably caused by a multitude of factors. Goodman and Boissonnault (1998) hold that "possible etiologic theories include diet; viral origin; sleep disorder; occupational, seasonal, or environmental influences, psychological dysfunction; and a familial or hereditary link" (p. 115).

Persons who have fibromyalgia experience bilateral tender points throughout several muscle groups in their body "including the neck, back, arms, legs, jaw, feet, and hands" (Goodman & Boissonnault, 1998, p. 117). They also develop sleep disturbances, which cause fatigue. Symptoms are often worse during times of stress such as "physical activity ('overloading it') including over-stretching; damp or chilly weather; heat exposure or humidity; sudden change in barometric pressure; trauma; or another illness" (Goodman & Boissonnault, 1998, p. 117).

Traditional Medical Treatment

Research is continuously being performed to find a treatment or possibly a cure for arthritis. Currently there is no cure, but there are methods to reduce symptoms. Physicians assist individuals with arthritis by prescribing medications such as analgesics and/or antidepressants and by providing surgical correction of joints (Goodman & Boissonnault, 1998).

The pain from osteoarthritis is often treated with nonsteroidal anti-inflammatory drugs (NSAIDs) or aspirin. Surgical procedures such as "arthroscopic lavange and debridement, osteotomies or bony resections, and total joint replacement[s]" are performed when the pain or loss of function is severe (Goodman & Boissonnault, 1998, p. 661). Treatment approaches for individuals with fibromyalgia often include "education and support, stress management and lifestyle training ..., medications ..., local modalities and techniques for muscle pain, and conditioning and aerobic exercise" (Goodman & Boissonnault, 1998, p. 117). Cognitive behavioral therapy may also be a treatment technique for individuals with fibromyalgia. Individuals with rheumatoid arthritis are educated on the disease, receive NSAIDs or corticosteroids for pain and inflammation, but bed rest is rarely prescribed (Goodman & Boissonnault, 1998).

Role of Occupational Therapy

Occupational therapists (OT) assist individuals with arthritis through education, splinting to protect inflamed joints from deformity, environmental adaptation, exercise, and activities. OTs provide education on the course of the disease, nutrition, joint protection techniques, using proper body mechanics and work simplification techniques for daily activities, stress management techniques, coping strategies, and developing daily routines to encourage a balance of rest, work, and play (Melvin & Jensen, 1998).

Splinting is utilized to protectively position the joints to prevent deformity. This may be beneficial for individuals with rheumatoid arthritis and individuals with osteoarthritis. The splints may be constructed for daytime use to wear while performing daily activities and/or for nighttime wear or when resting the joints (Fess & Philips, 1987; Coppard & Lohman, 1996).

OTs also instruct the individual in safe performance of exercises to reduce pain and edema, increase or at least maintain joint range of motion, muscle strength, and endurance.

Benefits and Principles of Exercise

Moderate exercise and incorporating periods of rest into one's daily activities is recommended for individuals with arthritis. The proposed benefits of exercise include increased range of motion, strength, and bone density, and decreased fatigue, pain, and depression (Goodman & Boissonnault, 1998; Lorig & Fries, 1995). The proposed benefits are not based on research; they are based on expert opinion of physicians specializing in rheumatology.

Though common beliefs hold that a swollen joint should be rested, present research indicates that this may not be true, especially for those with arthritis. Lyngberg, Danneskoild-Samsoe, & Halskov (1988) found that exercise assists in reducing the number of swollen joints of an individual with RA.

Though pain may prohibit one from exercising, it is more accurately a reason to exercise. Rowland W. Chang and Patricia A. Lee (1996), explained that "exercise causes a release of β-endorphins; endogenous opiates that have analgesic effects" (p. 92). Chang and Lee (1996) also

suggested that exercising a joint that is painful might stimulate joint receptors that are considered to inhibit pain.

Range of motion exercises, or stretching, maintain or increase the range of motion the joints can perform. Astrand (1987) explains additional benefits to range of motion exercises. In exercise, stress is placed on the structures of the joint that stimulates changes in the cellular composition of the structures of the joint. This increases the tensile strength of the joint structures so that daily stresses are less detrimental.

Bone density is also positively affected by exercise. Chang and Lee (1996) wrote that "weight-bearing exercise is known to place adequate stresses on bone to stimulate calcium absorption into bone and increase density and compressive strength" (p. 92). This statement is not based on empirical research on arthritis.

As an individual reduces the amount of activities in which he or she engages, his or her strength decreases due to immobilization and disuse. By engaging in exercise one can use muscles and eventually increase strength.

The cause of fatigue is multi-factorial. Fatigue results from the arthritis disease process, especially in the case of rheumatoid arthritis. However, fatigue is also the result of decreased activity. During exercise the muscles of the cardiovascular and respiratory systems are used as well as the skeletal muscles. Chang and Lee (1996) stated that "these changes lead to more efficient transport of oxygen and nutrients to working tissues and transport of waste products away from them," which may decrease fatigue because the body is working more efficiently (p. 92).

To prevent injury and joint damage, individuals with arthritis need to appropriately exercise. James F. Fries, M. D. (1979), a professor of medicine at Stanford University School of Medicine, suggests that individuals should engage in exercise on a regular basis and progress to higher levels slowly. Fries (1979) offered following "do's" and "don'ts" to structure the exercise routine of an individual with arthritis:

> Do be regular and slowly progressive with your exercise program. Do stretching and range-of motion exercises on a regular basis. Affected joints should be stretched to the limitation of discomfort several times daily in order to prevent permanent stiffness at the joints. Do smooth regular exercises with many repetitions. ... Don't do high-tension exercises requiring forces across the joints (p. 92).

Aquatic Exercise

Land-based exercises may cause excessive impact on joints and resistive weight training is not advised for individuals with arthritis because this requires too much force on the joints (Fries, 1979). Goodman and Boissonnault (1998) suggested the following for persons with fibromyalgia: "aquatic therapy is an ideal way to begin conditioning with low-level progressive exercises, gradually increasing strength and endurance while improving overall cardiovascular fitness" (p. 118).

Benefits Promoted by the Properties of Water

The benefits of aquatic exercise are believed to include decreased pain and joint compression; and increased ease of range of motion, strength, endurance, and relaxation. Sensory and social benefits have also been suggested (McNeal, 1990).

McNeal (1990) discussed how she thinks pain is decreased through aquatic exercise by stating the following:

> Frequently, subjective pain symptoms decrease while in the water, a finding that may be attributed to any of the following factors.
>
> - Increased sensory input from the turbulence, pressure, and the temperature of the water
> - Decreased muscle activity and resulting relaxation gained from the buoyancy of the water
> - Decreased joint compression secondary to the buoyancy of the water

- Increased mental and social stimulation serving as a distraction from the pain (p. 916).

There are several properties of water that support the argument that exercising in water is a more beneficial environment for an individual with arthritis than land-based exercise. These properties include buoyancy, hydrostatic pressure, resistance, and specific heat of water. Each of these properties assists in producing different beneficial effects of exercise for individuals with arthritis.

Buoyancy. Buoyancy can be explained by Archimedes principle, as cited by Roxane L. McNeal (1990), which states that

> the upward force or flotation of an object is equal to the weight of water it displaces. The buoyancy is affected by the volume of the object and the density of the object. A body will float if it displaces a weight of water equal to its own weight (p. 922).

Buoyancy is assistive, resistive, or supportive to the joints. The upward force assists motion by helping to raise one's limb when he or she is performing an exercise, which may help to maintain or increase one's ROM. Buoyancy resists movement when an individual is pushing against the upward force during an exercise. This helps to increase one's strength and endurance. Buoyancy supports the weight of the limbs and joints, thus decreasing weight bearing. The depth of the water controls the percentage of body weight the individual supports. As McNeal (1990) states, if the water is "neck height = [the individual must support] 10% [of his or her] body weight, chest height = 25% body weight, [and] waist height = 50% body weight" (p. 922). Decreasing the body weight that an individual must support decreases the load and impact on the joints. Reduction in the load to the weight bearing joints may reduce pain during exercise.

Kline Mangione, Axen, and Haas (1996) found that mechanically reducing one's body weight while running on a treadmill did not reliably decrease the pain experienced by an individual with osteoarthritis. Though the mechanical unweighting simulated the buoyancy of water, it does not draw a direct comparison. The study only reduced the participants' body

weight by 20% or 40% whereas submerging the body to the neck in the pool reduces an individual's body weight by 90% (Kline Mangione et al., 1996; McNeal, 1990).

When an individual moves his or her limb through the water, the water provides resistance to the movement. McNeal (1990) writes that "this effect of the water allows smooth resistance without uneven pressure or a strong torque at the end of the limb" (p. 923). This supports the argument that aquatic exercise is more beneficial for an individual than weight lifting because weight lifting does not disperse the force across the entire limb. The resistance that one experiences in water can be altered by the speed of the movement. As speed increases so does the resistance to the motion (McNeal, 1990). Water is unique in that it provides resistance in any direction or plane of motion. Turbulence in the pool also provides resistance to motion (McNeal, 1990). The force of buoyancy and resistance exerted on one's body also requires the individual to utilize trunk and postural muscles in order to maintain an upright position while in the pool (McNeal, 1990).

Hydrostatic pressure. Hydrostatic pressure is explained using Pascal's law (Bates & Hanson, 1996). This law states that the pressure of the water is distributed equally over the surfaces of an object that is immersed in the water. Hydrostatic pressure assists in venous return and therefore helps to reduce swelling in the extremities (Bates & Hanson, 1996 & Weinstein, 1986). This pressure also helps to stabilize joints (Bates & Hanson, 1996).

Water temperature. The heat of the water is a property that may benefit someone with arthritis. No definitive studies have been performed to determine the appropriate temperature for aquatic movement programs. For most aquatic movement programs for individuals with arthritis, the literature suggests that the water should be a minimum of 83°F. As stated in the Arthritis Foundation YMCA Aquatic Program (AFYAP) and AFYAP PLUS: Guidelines and procedures manual (1996), "the warmth and buoyancy of water can help decrease pain and/or stiffness and help improve or maintain joint flexibility" (p. 2). The heat of the water aids in the transportation of minerals in the body because blood flow increases. Heat can also decrease the viscosity of

structures in the body. This may reduce edema and facilitate softening of scar tissue. Additionally, the warmth of the water may promote relaxation.

Additional Benefits for Individuals with Arthritis

Templeton, Booth, and O'Kelly (1996) found that aquatic therapy decreased the pain experienced by individuals with rheumatic disease. Templeton et al. (1996) wrote that the "decrease in degree of pain may be attributed to the aquatic exercises, the heat of the therapeutic water (91.3° F), positive motivation, or to a possible increase in medication taken by the subjects" (p. 380). In a case report on a woman with degenerative joint disease, DeVylder (1995), a physical therapist, found that an aquatic program decreased the woman's pain. Prior to the program, the woman reported experiencing intense pain in the morning. She rated her pain a 10 on a scale of 0 to 10 before engaging in the study and then stated that she did not experience the pain in the morning after completing the aquatic program (DeVylder, 1995).

Though increased range of motion is a proposed benefit of aquatic exercise, only a few studies have been performed to support or deny this premise (Arthritis Foundation, 1996; McNeal, 1990; Goodman & Boissonnault, 1998; Gordon, 1993). Templeton et al. (1996) conducted a study of individuals with rheumatic disease to determine the efficacy of aquatic exercise on an individual's range of motion and functional abilities. The study found that individuals demonstrated a significant increase in their available range of motion in ankle dorsiflexion, hip abduction, and in shoulder flexion (Templeton et al., 1996). However, they also found a decrease in elbow extension, which "may be attributed to a lack of adequate attention paid to that task during the exercise" (Templeton et al., 1996, p. 380). Susan DeVylder (1995) reported that her client experienced an increase in ROM after engaging in aquatic therapy program. Prior to the program, the client was able to bend her cervical spine to the right 30%, and to the left 20% of normal. The client's trunk range of motion when bending in forward flexion was 50% and her hamstring flexibility was 45% bilaterally. Upon completion of the program, the client achieved the following gains "cervical side-bending to the right (to 100% of

normal values) and to the left (to 50%). Forward flexion of the trunk increased to 75%, and hamstring flexibility increased to 60° on the left and 55° on the right" (DeVylder, 1995, p. 111). Suomi and Lindauer (1997) conducted a study on the ability of the Arthritis Foundation aquatic program to improve shoulder and hip abduction range of motion and peak torque scores, or strength, in women with arthritis. A significant increase was found in hip abduction range of motion and strength (Suomi & Lindauer, 1997).

Endurance level is described in terms of the amount of activity that can be performed without rest breaks. This is also defined in terms of muscular or cardiovascular fitness. Increased endurance, in terms of muscular and cardiovascular fitness, has been cited as a benefit of aquatic exercise (Goodman & Boissonnault, 1998; Johnson, 1988; McNeal, 1990; Melton-Rogers, Hunter, Walter, & Harrison (1996); and Templeton et al., 1996).

There are conflicting findings in the literature regarding the affects of aquatic exercise on endurance. Melton-Roger, et al. (1996) performed a study comparing the cardiorespiratory reactions and the experience of pain while riding a bicycle on land and running in water by individuals with RA. They found that the participants had a lower peak oxygen uptake and did not have less pain in the water. They feel that this may be attributed to the fact that the participants in the study were recently diagnosed with RA. This response is expected, as McNeal (1990) stated, "smaller oxygen uptake in the water is reported because of less muscle mass is demanded for stabilization, which additionally accounts for lower heart rate" (p. 917).

In the study conducted by Melton-Rogers et al. (1996), the participants experienced a higher heart rate while in the water and stated that their perceived exertion was greater (1996) than on land. McNeal's (1990) explanation and Melton-Rogers et al.'s (1996) findings disagree. However, both the land based exercise and the water exercise achieved the training levels set by the American College of Sports Medicine that are needed to cause a change in the cardiovascular system (Melton-Rogers et al., 1996).

Kline Mangione et al. (1996) conducted a study on the influence of reducing the weight of an individual with OA while running on a treadmill on pain, which was mentioned earlier. This study reported findings that support McNeal's (1990) explanation. Kline Mangione et al. (1996) found that there are inverse relationships between oxygen consumption and the amount of body weight supported during exercise and between heart rate and the amount of body weight supported during exercise. Though this study did not explore the effects of submerging the body in water, the mechanical unweighting of the participants may be argued to simulate the effects of water and buoyancy. Kline Mangione et al. (1996) also found that individuals reached a target heart rate and exercised longer when their body weight was decreased by 20% and 40% while running on a treadmill. Unfortunately, these results cannot completely be compared to aquatic exercising because the water usually supports more of the body weight than was supported mechanically. During most aquatic exercise programs, the water level is at the participant's neck or chest height, thus supporting 90% and 75% of the individual's body weight respectively (McNeal, 1990).

A few studies have been performed on the relationship of aquatic exercise programs to changes in an individual's functional abilities, or activities of daily living (ADL). In DeVylder's (1995) case study of a woman with degenerative joint disease, the client was able to vacuum and lift heavy objects after engaging in an aquatic program. The client was previously unable to perform both of these tasks "without being confined to bed the following day" (DeVylder, 1995, p. 110). Templeton et al. (1996) found that an eight-week aquatic program improved the participants' functional status. The length of the aquatic exercise program may influence the benefits that participants experience.

Aquatic Exercise Programs: General Structure

No research has been published on the appropriate structure of aquatic exercise classes, however there are general guidelines that are accepted by the leaders in aquatic exercise. The heat of the water is considered to be very important. For individuals who are able to perform

vigorous active movements in the water, temperatures between 82°F and 86°F are sufficient (McNeal, 1990). For pain relief the water should be no cooler than 84°F (McNeal, 1990). The joints that are being exercised should be submerged in the water to increase the benefits of the water exercises (Arthritis Foundation Instructor's Manual, 1996; McNeal, 1990). The pool depth is important in terms of the individual's ability to maintain a position in order to perform an exercise correctly (McNeal, 1990).

McNeal (1990) states the importance of breathing correctly while performing the exercises. Diaphragmatic breathing should be included in the exercises by "coordinate[ing] the inhalation and exhalation with the movement pattern if appropriate, otherwise perform the breathing technique independently of the exercise" (McNeal, 1990, p. 927).

McNeal (1990) also discussed the importance of continuous movement rather than jerky movements while exercising in the pool. She stated that "exercises are performed in a rhythmical, fluid manner without stopping at any one point in the range. Stopping at any one position will result in a loss of resistance until the speed is reinitiated" (McNeal, 1990, p. 927).

Finally, it is important to tailor the exercises to the individual's needs and abilities. McNeal (1990) stated that "the speed at which the exercises are performed is limited by the patient's strength and ability to stabilize the rest of the body" (p. 927-928). The range of motion that is executed during the exercise can also be altered. McNeal (1990) suggested that the individual should "gradually increase the size of the movement as tolerated for a greater level of exertion" (p. 928). Pain should be monitored. If the individual experiences pain, the exercise should be performed to a lesser degree or stopped until he or she is able to tolerate the movement without severe pain (McNeal, 1990).

Thus, it is not simply the properties of water that are important when an individual is exercising in the pool; the structure of the program is equally important. An established program, the Arthritis Foundation YMCA Aquatic Program (AFYAP) will be explored.

Arthritis Foundation YMCA Aquatic Program (AFYAP)

The AFYAP is a structured aquatic exercise program for individuals with arthritis. This program has been operating since 1983 and has been continually updated throughout the years. Since 1995 every chapter of the Arthritis Foundation across the nation has been offering these classes, and in 1995 there were 84,430 participants (Arthritis Foundation Guidelines and Procedures Manual, 1996).

The basic AFYAP class "consists of 68 range-of-motion and muscle strengthening exercises and an optional endurance segment lasting up to a maximum of five to 10 minutes" (Arthritis Foundation Guidelines and Procedures Manual, 1996, p. 1). Classes usually run for six to ten weeks, and individuals are asked to attend two to three sessions a week (Arthritis Foundation Guidelines and Procedures Manual, 1996). Individual sessions usually run for half an hour to 45 minutes. The leaders must attend a training course and teach six sessions under the supervision of a certified leader in order to become certified. A lifeguard must be on duty during the classes if the leader is not certified in lifeguarding.

The leaders are only allowed to instruct the participants on the specific exercises that the Arthritis Foundation has approved. This is to ensure the safety of the participants. The class members are instructed to monitor their abilities and pain. Participants are instructed to only perform the exercises to the point of pain (Arthritis Foundation Instructor's Manual, 1996). It is important to not increase pain, but this must be balanced with utilizing as much range of motion as comfortable. Additionally, the AFYAP stresses the importance of the general principles of aquatic programs, the properties of water, and the way individuals with arthritis should exercise as stated above (Instructor's Manual, 1996; Guidelines and Procedures Manual, 1996).

Aquatic Exercise and OT

Swimming is an occupation in which individuals with arthritis may safely perform exercises to reduce the effects their disease. Occupational therapists use aquatic exercise to facilitate client gains in strength, range of motion, flexibility, and social interaction while

decreasing pain and fatigue. Heck (1988) found that individuals are able to tolerate pain longer if they are engaged in a purposeful activity. Occupational therapy uses activities, or occupations to manage pain (Heck, 1988). As strength, range of motion, flexibility, social interaction, pain, and endurance improve through engaging in aquatic exercise, it is proposed that an individual with arthritis will improve in everyday functioning.

Arthritis alters persons' lifestyles from that which was experienced prior to the disease. Individuals with arthritis may not be engaging in their typical activities or roles due to pain and/or fatigue. For example, an individual may have previously enjoyed walking through the woods with a group of friends, or playing golf, but symptoms of arthritis, pain, fatigue, and decreased strength, may become so overpowering that the individual gives up enjoyable occupations. This decreases social interaction and may cause a sense of isolation. Lifestyles may be altered on a more personal level, there may be difficulties completing Activities of Daily Living (ADL) or Instrumental Activities of Daily Living (IADL) as well.

Summary

Though many benefits of aquatic exercise programs have been suggested, unfortunately little research has been performed to empirically confirm these benefits. An area that has been neglected is the relationship of engagement in aquatic exercise programs to improvement in performance of functional activities. Engaging in exercise has been suggested as a positive influence on physical, social, psychological, and emotional wellness, which is thought to influence one's abilities to perform his or her activities of daily living and instrumental activities of daily living. Trombly (1995) stated that "it has been recently demonstrated that aerobic exercise by people with arthritis results in an increased aerobic and ADL capacity and is enthusiastically accepted by the patients. ... Water exercise has also been shown to increase strength and endurance in arthritis patients" (p. 824-825).

Efficacy of an Aquatic Movement Program for Individuals with Arthritis

Chapter 3: Methodology

Hypotheses

Since engagement in aquatic exercise or movement programs may be beneficial to the health and well being of people with arthritis, the following null hypotheses were tested through this study.

1. There is no significant difference in an individual with arthritis's physical functioning during daily activities after engaging in an aquatic movement program.
2. There is no significant difference in an individual with arthritis's pain after engaging in an aquatic movement program.
3. There is no significant difference in an individual with arthritis's affect after engaging in an aquatic movement program.
4. There is no significant difference in an individual with arthritis's social interaction after engaging in an aquatic movement program.

Limitations and Delimitations

1. This study did not explore the long-term effectiveness of the AFYAP for individuals with arthritis.
2. An AFYAP in Ithaca, New York was the focus of the study; thus other AFYAPs or other established aquatic movement programs across the country were not assessed.
3. A sample of convenience was utilized and the sample size was small.

To ensure the largest sample size, individuals with various types of arthritis were studied at the same time.

4. The study only investigated the effectiveness of the AFYAP in terms of the impact of arthritis on a sampling of physical functioning when performing daily activities (mobility level, walking and bending, hand and finger functioning, arm function, ability to perform self-care tasks, and household tasks) and psycho-social issues (engagement in social activity, support from family and friends, arthritis pain, work, level of tension, and

mood). This was not considered an exhaustive list of the probable benefits of aquatic programs for individuals with arthritis.

5. The swimming pool at Longview in Ithaca, New York was utilized for this study. This pool is three feet and four inches deep, therefore it is not the ideal depth for this class. The program needed some modification as a result. The participants were asked to squat in the water when performing shoulder and elbow exercises in order to submerge the joints in the water. This was considered to be safe for the participants' joints due to the principle that 90% of an individual's body weight is supported when the water is at the level of the individual's neck and 75% of one's body weight is supported with the water at chest level (McNeal, 1990).

6. A control group was developed through a group of individuals at Longview who have arthritis, but either chose not to participate in the aquatic classes or were unable to for some reason (such as time constraints, unable to obtain physician's approval, or uninterested in engaging in the aquatic classes).

Assumptions of the Study

1. The AFYAP is a representative aquatic movement program for individuals with arthritis.
2. The instructor strictly adhered to the AFYAP guidelines and protocols.
3. The participants performed the exercises as explained by the instructors.
4. The group of participants studied was representative of individuals participating in AFYAP courses across the United States of America.
5. The participants answered the assessment questions honestly.
6. The participants did not have significant cognitive deficits that impacted their ability to complete the survey.
7. The researcher's presence during the completion of the assessments did not affect the participants' performance on the evaluation tools.

8. The control group, which was composed of those individuals with arthritis who were not actively engaging in an aquatic movement program, was comparable to the experimental group, which was composed of individuals with arthritis who were enrolled in the AFYAP.

Participants and Selection Method

The participants were recruited from the residents of Longview. Longview is a residential community for senior citizens located in Ithaca, New York. An advertisement was placed in the Longview newsletter and flyers were posted around the site asking people with arthritis to attend one of two recruitment/informational meetings. The advertisements explained that the purpose of the meetings was to recruit individuals with arthritis to participate in an aquatic movement program. The recruiting sessions explained the project, including the survey and the class sessions. General information about occupational therapy was also discussed. The first twelve individuals who signed up to participate in the study who have arthritis, were able to attend the scheduled class sessions, and received written permission from their physician were included in the program. The researcher obtained permission from the study participants to obtain written consent to engage in the aquatic classes from his or her physician. (Please refer to appendix B for copy of the physician permission form.) Individuals who met the inclusion and exclusion criteria, but who did not wish to participate in the class for various reasons such as time constraints were asked to be members of the control group. Participants who were already in the study also recruited additional participants through their contacts in the Longview community to increase the number of individuals involved in the study.

An individual needed to meet the following inclusion criteria to partake in the study.

- Have some form of arthritis.
- Be over the age of 50.
- Be able to attend the scheduled class sessions if he or she wishes to be a part of the experimental group; if not he or she may be a member of the control group.

- The individual must have written consent from his or her physician to participate in the experimental group of the study.
- Sign an informed consent form approved by the College Review Board of Human Subjects. (Please see appendix A for informed consent forms for the participants of the new class, preexisting class, and the control group respectively.)

Exclusion criteria for the study included the following.

- Individuals with severe medical conditions such as cardiovascular problems, seizure disorder, or narcolepsy, which is contraindicated.
- Failure to complete both the pre and posttests.
- Failure to complete the informed consent form.

Operationalization of Concepts into Variables

1. **Aquatic Movement Program** is any exercise program that is performed in a heated pool and is not necessarily considered a swimming program. The AFYAP protocols were used, therefore the participants were instructed on range of motion and strengthening exercises that were approved by the Arthritis Foundation for individuals with arthritis to be done in water between 83 and 88 degrees Fahrenheit.

2. **The Arthritis Impact Measurement Scale 2 (AIMS2)** is a self-report questionnaire that asks about mobility level, walking and bending, hand and finger functioning, arm function, ability to perform self-care tasks, household tasks, engagement in social activity, support of family and friends, arthritis pain, work, level of tension, and mood. (Please refer to appendix D for a copy of the questionnaire.)

3. **Borg Rate of Perceived Exertion Scale** is a scale from 1 to 20 that the participants used to monitor their intensity level while exercising (American College of Sports Medicine, 2000). This was used to increase the safety of the participants by ensuring that they were not working too hard. (Please refer to appendix C.)

Measurement Instruments

AIMS2

The Arthritis Impact Measurement Scales 2 (AIMS2) was used as a pre and posttest to measure the participants in the control group and in the experimental group. The AIMS2 was developed from the AIMS. The original assessment, the Arthritis Impact Measurement Scale (AIMS) was developed in 1979. Bush's Index of Well-Being, Rand's Health Insurance Study, and the Rand Anxiety and Depression batteries were incorporated in the AIMS (Meenan, Gertman, & Mason, 1980). The AIMS also includes items on social role, activities of daily living, dexterity, and pain. The AIMS asks an individual to rate mobility, physical activity, dexterity, social role, social activity, activities of daily living, pain, depression, and anxiety variables on a Likert scale (please refer to appendix D for the AIMS2 scale). The AIMS scale was standardized and "construct validity, reliability, and feasibility were established" (Dittmar & Greshman, 1997, p. 160).

Meenan, Gertman, and Mason (1980) conducted a study of the AIMS on one hundred and four individuals with various types of arthritis. The results provided "strong statistical evidence of scale reliability" (Meenan, et. al., 1980, p. 148). Generally, the AIMS subscales were found to be significantly correlated with age, general health perceptions, and the physician's report, thus establishing the validity of the questionnaire (Meenan, et. al., 1980). The AIMS's reliability and validity were retested in 1981, this time with a sample size of 625 participants (Meenan, Gertman, Mason, and Dunaif, 1982). The nine components (mobility, physical activity, dexterity, household activities, activities of daily living, anxiety, depression, social activity, and pain) were found to be highly reliable. Additionally, "the 9 component scales of AIMS, ... have been shown to explain substantial and highly significant percentages of variance in 4 general measures of health status, 2 of them patient derived and 2 of them physician derived" (Meenan, et. al., 1982, p. 1052). The AIMS was also found to be fairly stable for a 6-month period and sensitive so it may be used as an outcome measure (Meenan, et. al., 1982).

Meenan, Mason, Anderson, Guccione, and Kazis developed the AIMS2 in the early 1990's. This was developed to be more comprehensive and sensitive tool than the AIMS (Meenan, et. al., 1992). The original items on the AIMS were revised and three scales, arm function, work, and social support were added.

The AIMS2 possesses the following subsections: mobility level, walking and bending, hand and finger functioning, arm function, ability to perform self-care tasks, household tasks, engagement in social activity, support from family and friends, arthritis pain, work, level of tension, and mood. Mobility level refers to the ability an individual has to be able to get to and from desired locations when performing daily activities. Walking and bending is considered in the context of daily activities. Bending is defined as flexion of the hip joint in the upright position, or bringing the upper body toward the ground from a standing position. Hand and finger functioning is the degree to which an individual is able to use his or her hands and fingers to perform desired activities throughout the day. Arm function is the degree to which an individual uses his or her arm to perform desired tasks throughout the day. Self-care tasks are performed to maintain personal health and hygiene. These include dressing, bathing, grooming, etc. Household tasks include chores that are performed to maintain one's living environment and includes the following examples: laundry, dishes, yard work, cleaning, etc. Social Activity is any thing an individual engages in to interact with others. Support from family and friends is the emotional aid that an individual's social system provides. Arthritis pain is physical pain that one experiences as a result of arthritis that may limit the amount of activity that an individual can tolerate. Work includes paid employment and unpaid tasks that are performed to meet a goal and may be considered pleasurable, unenjoyable, or indifferent. Level of tension is the amount of psychological stress one experiences. Finally, mood is considered one's affect or the way an individual feels emotionally. It may also affect one's perceptions and engagement in meaningful occupation.

A pilot study was performed on 24 participants and measurement performance was assessed on 408 participants. Internal consistency and test-retest reliability were found to be fairly high. The validity of the assessment was also found to be significant (Meenan, et. al., 1992).

The AIMS2 incorporates the variables of interest in one instrument and is specifically designed for individuals with arthritis. The AIMS2 was adapted to conform to the standards of the Ithaca College All-College Review Board for Human Subjects Research. The last sentence of the instructions that reads "please answer every question" was deleted because the participants have the right to omit any question that they do not feel comfortable answering.

Borg Rate of Perceived Exertion

The members of the experimental group used the Borg Rate of Perceived Exertion Scale (RPE) throughout the classes to gauge the intensity of the exercises they were performing. The RPE was used to increase the safety of the participants during this research project. The American College of Sports Medicine's guidelines (1995) state that "it has proven to be a valuable aid in prescribing exercise for individuals who have difficulty with HR [heart rate] palpation, and in cases where the HR response to exercise may have been altered due to a change in medication" (p. 162). By using this scale the individual was able to monitor his or her exercise intensity in order to reduce the risk of overexertion. As Lockette and Keyes (1994) stated, "the RPE scale can be used as a guide to safely adjust exercise intensity to your own tolerance" (p. 46).

Prior to initiation of the aquatic movement program, the participants were educated on the Borg Rate of Perceived Exertion Scale. A seven means that the individual feels that he or she is working "very, very light", a 13 means the individual is working "somewhat hard", and so on. A 19 means the individual is working "very, very hard" (American College of Sports Medicine, 2000). The participants in the aquatic classes were asked to monitor and gauge their work out. If they felt that they were working at a 15 or above, they were instructed to decrease the range of

motion they were performing or decrease the speed or repetitions they were completing. If an individual was working above a 17, they would have been asked to stop the session and rest. The participants in the aquatic classes were asked to rate themselves on this scale every twenty minutes in a class session. Thus, the participants rated themselves three times during each aquatic class session. The researcher stopped instructing exercises at this time and asked each of the members to rate him or herself. These scores were recorded to recognize who was having a difficult time with the exercises. The researcher also observed to determine if an individual was working too hard. Signs, such as gasping for air, holding one's chest, or the general appearance of fatigue would have indicated overexertion. An individual would have been asked to do less during the activities or to sit out during that class session if these signs had occurred.

Steps to Increase Safety

In addition to using the Borg Rate of Perceived Exertion Scale and obtaining physician's approval prior to participants starting the aquatic movement program, a lifeguard was on the deck of the pool during each class session to increase the safety of the participants. One class was cancelled because a lifeguard was not available. The lifeguards were recruited from Ithaca College students who had current lifeguard certification. The participants were asked to wear non-slip aquatic footwear (i.e. "aqua socks") to decrease the risk of falls, but few participants followed this recommendation. Many of the participants wore rubber-soled shoes while in the locker room or walking around the pool, but few participants wore shoes in the water. This was not mandated so the participants did not have to incur an expense for the class. Participants were also notified about donated bathing suites so that more individuals could partake in the classes. The participants were asked to take a shower before and after the classes and to wear warm clothing home to decrease the risk of catching a chill. The pool is located inside the residential building of Longview and the participants could reach the pool area without going outside.

Treatment Procedures

The guidelines and protocols of the AFYAP were strictly followed. The participants were instructed to perform only the exercises to the extent that they felt comfortable. They were instructed to walk in place or do a different exercise if an exercise was painful for them. Each session followed this basic format: walking, deep breathing, neck, trunk, upper extremity, and lower extremity stretching exercises. Games and songs were also incorporated into the sessions to increase the fun and enjoyment in the program. Joint protection techniques were discussed and demonstrated during the aquatic sessions.

Withdrawal

In accordance with the protocols of the Ithaca College Human Subjects Review Board, participants had the right to withdrawal from the study at any time. If an individual had withdrawn from the study his or her initial data on the AIMS2 would not have been used when analyzing the data. Two participants engaged in one class session and did not wish to come to additional classes. These individuals did agree to complete the survey and become part of the control group.

Design for Gathering, Analyzing and Interpreting Data

A meeting was held prior to the initiation of the aquatic classes and the participants in the experimental group were asked to complete the AIMS2. Individuals who attended this meeting and did not wish or were unable to attend the classes were asked to complete the AIMS2 as part of the control group. Members of the preexisting aquatic class at Longview were also asked to complete the pre and posttest. The members of the aquatic classes recruited additional participants for the control group by asking neighbors and friends to participate in the study. These individuals were contacted by phone for the distribution and collection of the survey. The scores on the RPE were not analyzed as this was only incorporated into the program to increase the safety for the participants.

After the data were collected, the pre and posttest AIMS2 questionnaires were scored for each participant with the aid of the SPSS computer program designed to aid in data analysis. The researcher assumed that items requesting a "yes" or "no" response that were left blank were a "no" response and recorded as "no" responses. Additionally, the researcher selected the first response, when reading left to right, of a participant if he or she recorded two answers for the same item. Many of the items needed to be recoded to the correct direction as indicated in the AIMS2 User's Guide Table 1 (please refer to appendix E). Item 69 was also recoded, it asked "During the past month... How often have you had to take MEDICATION for your arthritis?" and provided the following selections "All Days (1); Most Days (2); Some Days (3); Few Days (4); and No Days (5)". The researcher determined that item 69 should be recoded according to the scoring directions in the AIMS2 User's Guide, which states that "the AIMS scales are scored in a consistent fashion so that a low value indicates a high health status" (p. 2). The raw scores were then normalized for each section so that each section is within the range of 0 to 10 (AIMS2 User's Guide Table1). Then, the normalized scores were used to compute each of the components in the five component model of health status. Table 2 of the AIMS2 User's Guide provided the formulas to convert the sections into the five components: physical, affect, symptom, social interaction, and role. These components, with the exception of role, were used as the variable to test the hypotheses. Work was not used because the researcher assumed that the participants did not define work as something other than paid employment and many left this section blank and indicated that he or she was retired, thus making it impossible to compute the data of this component.

A correlated, or paired t test was performed to compare the data collected on physical functioning, pain, affect, and social interaction in the pre and posttests of the experimental and control groups. As stated by Stein and Cutler (1996), the paired t test is appropriate when comparing "the difference between pretest and posttest scores of an observed variable" (p. 288).

Several steps must be completed to perform a paired t test (Stein & Cutler, 1996). The first step in a paired t test is to state the hypothesis. The hypotheses of this study are in the format of a null hypothesis. Next, the level of significance must be determined. In this study, the level of significance was p=.05. The third step is to choose to conduct a one- or two-tailed test. Since null hypotheses without a direction were being tested, a two-tailed test was performed. The critical value must be obtained from the statistical table. This is done by looking for the degrees of freedom (the number of participants minus one), the level of significance (p=.05), and whether it is a one or two-tailed test in the statistical table. Next, the group means and standard deviations for the pre and posttests were calculated. Step six involves performing an "exploratory data analysis by determining if mean differences are greater than standard deviations for each variable" (Stein & Cutler, 1996, p. 289). Then, a graph should be drawn to see if there appears to be a significant difference between the means of the groups and if the groups' standard deviations are about the same. If a difference appears to be present, the observed t value should be calculated. In this formula, the observed value equals the sum of the differences between each participant's score divided by the square root of the number of participants multiplied by the sum of the squared differences on each score minus the sum of the differences between each participant's score on measured variables squared, which is divided by the degrees of freedom. Finally, the null hypotheses were either rejected or accepted. The null hypotheses were rejected when the calculated t value of the observed sample was greater than or equal to the critical t value found in the statistical table. The hypotheses were accepted if the observed t value was less than the critical t value (Stein & Cutler, 1996).

Scope and Limitations of Study

The scope of this study was limited to a small sample size to meet the constraints of time. This was a preliminary study that may be expanded in the future to include a different regional population, various AFYAP instructors, different pool environments, and other aquatic movement programs.

Efficacy of an Aquatic Movement Program for Individuals with Arthritis

Chapter 4: Results

Due to the time and location constraints of this study a sample of convenience was used. The residents of the Longview senior citizen residential community were sampled. The participants new to aquatic movement class and the participants of the preexisting aquatic movement class were combined to form the experimental group and the participants not engaging in the aquatic movement classes comprised the control group. There were 12 individuals in the experimental group and 9 in the control group. The characteristics of the groups, such as the number of sessions each person attended, age, and duration of arthritis are reported in Table 1. Two participants in the control group were initially in the experimental group, but chose to not attend more than 1 session each due to time constraints or personal choice, but did wish to participate in the control group.

Table 1

Characteristics of Participants

Characteristic	Mean		SD		Min		Max	
	E	C	E	C	E	C	E	C
# of sessions	13	.22	4.53	.44	7	0	22	1
age	79	84	5	5	70	78	88	93
years with arthritis	16	26	8	13	5	10	30	50

Note. E = experimental group (12 participants); C = control group (9 participants).

The frequencies of gender, type of arthritis, level of education, marital status, and income for each group are displayed in Table 2.

Table 2

Frequencies

Variable		Experimental Group (%)	Control Group (%)
Gender*	-female	91.7	77.8
	-male	8.3	11.1
Type of Arthritis*	-Rheumatoid	25.0	11.1
	-Osteoarthritis	50.0	77.8
	-low back pain	8.3	0.0
	-tendonitis/bursitis	8.3	0.0
	-osteoporosis	0.0	11.1
Level of Education*	-High school	25.0	11.1
	-1-4 yr. college	25.0	11.1
	-college graduate	33.3	44.4
	-professional/grad	16.7	11.1
Marital Status*	-Divorced	8.3	0.0
	-widowed	75.0	44.4
	-never married	16.7	44.4
Income*	-$10,000-19,000	33.3	11.1
	-$20,000-29,999	0.0	22.2
	-$30,000-39,999	33.3	33.3
	-$40,000-49,999	16.7	0.0

Note. * Values do not equal 100% due to omissions by the participants.

Paired t-tests were performed for each of the pre and posttest components, which form the four hypotheses for the study. The physical functioning, affect, and social interaction posttest component scores for both groups indicated improvement when compared with the pretest component scores. The symptom component scores for the control group indicated that their arthritis symptoms were worse than the experimental group's scores on the pre and posttests and in fact demonstrated a worsening of symptoms from pre to posttest. There is a statistically marginally significant difference between the pre and posttest scores of the affect component for the experimental group. The affect component mean for the experimental group decreased from 2.8500 to 2.3250, thus demonstrating improvement. According to the AIMS2 User's Guide, the lower the score, the better the individual is performing in terms of health status. Therefore, there is a statistically marginally significant difference ($p=.069$) in one's affect after engaging in a six-week aquatic movement program.

Thus, the first null hypothesis on physical functioning is accepted; there is no significant difference in an individual's physical functioning after engaging in an aquatic movement program. Null hypothesis number two on arthritis pain is also accepted. The third hypothesis on mood is accepted. However, there is a marginally significant difference in an individual with arthritis's mood after engaging in an aquatic movement program and it's in the positive direction, their mood improved. The final null hypothesis on social interaction is accepted; there is no significant difference.

Table 3

Paired T-Test of the Experimental Group

Paired Components	Mean	N[a]	SD	T	df	Sig. (2-tailed)
Pair 1						
Pretest Physical	2.0871	11	1.4651			
Posttest Physical	2.0284	11	1.1689	.287	10	.780
Pair 2						
Pretest Symptom	3.9091	11	2.4168			
Posttest Symptom	3.7273	11	2.2623	.649	10	.531
Pair 3						
Pretest Affect	2.8500	10	2.3664			
Posttest Affect	2.3250	10	2.2671	2.067	9	.069
Pair 4						
Pretest Social Interaction	3.1307	11	1.6525			
Posttest Social Interaction	2.9716	11	2.2386	.571	10	.580

Note. df is the degrees of freedom; Sig. is the level of significance of the paired component; The lower the score is, the less difficulty the individuals experience in the area.

[a]Numbers of participants out of 12 persons in the experimental group who completed all the questions that comprise the component.

All of the scores improved between pre and posttest component scores, except for the symptom component for the control group. No significant differences were found between the pre and posttest scores for the control group as all the significance scores are well above the acceptable .05.

Table 4

Paired T-Test of the Control Group

Paired Components	Mean	N[a]	SD	T	df	Sig. (2-tailed)
Pair 1						
Pretest Physical	3.0556	6	2.1872			
Posttest Physical	2.4861	6	2.1311	1.666	5	.157
Pair 2						
Pretest Symptom	4.5000	5	2.5249	-2.108	4	.103
Posttest Symptom	5.5000	5	3.0208			
Pair 3						
Pretest Affect	2.5938	8	1.2170			
Posttest Affect	2.4375	8	1.0999	.649	7	.537
Pair 4						
Pretest Social Interaction	2.9732	7	1.0550			
Posttest Social Interaction	2.9286	7	1.4345	.169	6	.871

Note. df is the degrees of freedom; Sig. is the level of significance of the paired component; The lower the score is, the less difficulty the individuals experience in the area. [a]Numbers of participants out of 9 persons in the control group who completed all the questions that comprise the component.

The findings show that affect improved for individuals in the experimental group by a marginally significant difference and did not significantly change for the control group. Therefore, the intervention of engaging individuals with arthritis in the AFYAP provided a positive effect on the participants' affect.

Efficacy of an Aquatic Movement Program for Individuals with Arthritis

Chapter 5: Discussion

Since all of the scores between pre and posttest components improved for both the experimental and control groups, except the control group's symptom component, which worsened, a Hawthorne Effect could be argued. There are many possible reasons why none of the changes in the other components were found to be significant for the experimental group. The six-week program may not have been long enough to effect a change. There may not be a large change because many of the experimental participants were previously enrolled in an aquatic class. Individuals who are new to an aquatic exercise program may experience a larger change than individuals who have engaged in the program for a while and the possible benefits have plateaued and they are in the program for maintenance and prevention. The pool may have been too shallow so that the participants could not reap as many benefits because squatting in the water may have been bothersome or they did not lower themselves into the water enough to support the joints during the exercises. The participants' arthritis may also not have been severe enough to affect their physical, symptom, or social interaction components. Finally, the program may not provide benefits to participants in the studied components.

As the old saying goes, "hindsight is 20/20". The researcher suggests many changes in the methodology of this study. A different pool should be utilized. However, there are a few benefits of the Longview pool. This pool was conveniently located for the participants because they didn't have to go outside in the bad weather and the researcher didn't have to cancel classes or be concerned about attendance because of the weather and poor travel conditions. The time of year the study was conducted may be considered beneficial because people don't seem to be as busy during the winter as they are during better climate months and were possibly able to attend more classes.

Ideally, the experimental group participants would be new to aquatic exercise; there should be a larger experimental and control group sample size, and a more heterogeneous population. The researcher would also have increased the time frame of the study to 10 weeks

instead of six weeks. The questionnaire should be shortened. This may increase the completeness and conciseness of the responses by the participants.

Aquatic exercise programs may be an effective treatment modality to include in an occupational therapy treatment regimen for individuals with arthritis. This study found that the experimental group did experience improvement in physical functioning, pain, affect and social interaction, but only affect was found to be statistically marginally significant. However, additional research should be conducted to determine if aquatic exercise is the most effective treatment for individuals with arthritis or if it should be used in conjunction with other occupational therapy treatment activities.

Efficacy of an Aquatic Movement Program for Individuals with Arthritis

Chapter 6: Summary

Aquatic movement programs may be an effective treatment modality for individuals with arthritis, but more research needs to be conducted to determine if the physical, symptom, affect, and social interaction components improve significantly. Research should also be performed to determine the effect an individual's mood has on physical functioning, pain, and social interaction. Additional research should be performed with a group that isn't as homogeneous to rule out or discover the possible influence of age, gender, educational level, income, marital status, duration of arthritis, and type of arthritis. More research should be conducted on the effects of the basic properties of water on symptoms to determine if the proposed guidelines are appropriate. Research on the most beneficial time frame, or duration of an aquatic exercise course should also be conducted. The AFYAP program and other aquatic exercise programs should be compared through research to determine what is the most beneficial for individuals with arthritis. This research is important to determine appropriate interventions for people with arthritis.

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Appendix A

ALL-COLLEGE REVIEW BOARD
FOR
HUMAN SUBJECTS RESEARCH

COVER PAGE

Investigators: Alison Eisnor

Department: Occupational Therapy

Telephone: (607)275-8095 (Campus) (315)245-1005 (Home)

Project Title: Determining the Benefits of an Aquatic Program for Individuals with Arthritis

Abstract:

The purpose of this study is to determine the benefits of an aquatic movement program for individuals with arthritis. Participants will be recruited from Longview and will be asked to engage in a six-week program. Aquatic exercise classes will be held twice a week for approximately 60 minutes in the Longview pool. The researcher, who will be a certified leader of the Arthritis Foundation YMCA Aquatic Program (AFYAP) will lead the class sessions. The AFYAP guidelines and procedures will be strictly adhered to in order to minimize risks of injury. Additionally, the participants will use the Borg Rate of Perceived Exertion Scale to monitor individual intensity level while exercising. This is a scale from 1 to 20, which usually relates to the individual's heart rate if multiplied by ten. Prior to the aquatic program, the participants will be asked to complete the Arthritis Impact Measurement Scale 2 (AIMS2). The AIMS2 is a self-report questionnaire that asks about mobility level, walking and bending, hand and finger functioning, arm function, ability to perform self-care tasks, household tasks, engagement in social activity, support from family and friends, arthritis pain, work, level of tension, and mood. Once the participants have completed the six-week program, completion of the AIMS2 will be requested again. A control group will be used if available and these individuals will be asked to complete the AIMS2 at the same two times as the exercise group.

Proposed Date of Implementation: January 17, 2000 through February 25, 2000

Alison M. Eisnor Carol Knight, M.Ed., OTR/L
Print or Type Name of Principal Investigator and Faculty Advisor

Signature (Use blue ink) Principal Investigator and Faculty Advisor

1. **General Information about the Study**
   a) **Funding:** The AFYAP certification process that the researcher went through was funded by the Ithaca AFYAP program that is held at the YMCA in Ithaca, NY. Longview has donated the use of the Longview Pool. The Occupational Therapy Department at Ithaca College will provide the photocopies of the AIMS2. The participants will not be asked to pay for the AFYAP classes, the classes will be held free of charge.
   b) **Location:** The aquatic classes will be held at the Longview pool and the assessments will be completed by the participants in the auditorium at Longview.
   c) **Time Period:** The aquatic movement classes will be held every Tuesday and Wednesday from January 18 to February 23. The participants will be asked to complete the AIMS2 prior to starting the exercise classes and after the last class has been completed.

2. **Related Experience of the Researcher**
   The primary researcher will obtain AFYAP leader certification by December 1, 1999 and is currently certified in CPR. Research and statistical analysis experience of the primary researcher includes the following courses: Biostatistics (670-39000), Research Seminar (672-49500), and Research Methods (672-67000). Additionally, the primary researcher has performed an extensive literature review on aquatic exercise programs and arthritis. Professor Carol Knight has extensive experience in aquatic exercise. She is a certified aquatic therapist, a certified aquatic exercise leader, and a certified AFYAP leader. Professor Knight also received the summer faculty research grant in 1999 called "Room to Work". This study looked at the person-environment transaction in elders. She also completed a master's thesis.

3. **Benefits of the Study**
   The AFYAP classes are designed to improve one's physical health through the exercises and increase social interaction by participating in the classes and interacting with the other participants. The AFYAP classes may also improve emotional wellness by feeling better about oneself because of the exercises. These factors may positively influence the individual's ability to perform his or her daily activities. One's emotional wellness may also improve because of the social interaction during the classes. By exploring these benefits, aquatic movement programs may be shown to be an efficient and effective way of treating individuals with arthritis. Thus, expanding the possible use of aquatic programs in occupational therapy and contributing to the knowledge of the profession.

4. **Description of Subjects**
   a) Twelve subjects will be recruited for the aquatic movement program and twelve subjects will be recruited for the control group.
   b) The subjects will posses the following characteristics: over the age of 50, have some form of arthritis, free of cognitive or emotional deficits, and free of any major health problems (such as severe heart problems)

5. **Description of Subject Participation**
   The subjects in the exercise group will be asked to participate in a six-week program of aquatic exercise following the AFYAP guidelines and procedures. During this six-week period the participants will be asked to attend two classes a week, each lasting approximately 60 minutes. During the class sessions the subjects will rate his or her intensity of exercise using the Borg Rate of Perceived Exertion Scale. This is a scale from 1 to 20, which usually relates to the individual's heart rate if multiplied by ten. The participants will be asked to use this scale every 20 minutes of each class, therefore the subjects will rate their intensity 3

times during each class session. Prior to the aquatic program, the participants will be asked to complete the Arthritis Impact Measurement Scale 2 (AIMS2). The AIMS2 is a self-report questionnaire that asks about mobility level, ability to walking and bend, hand and finger functioning, arm function, ability to perform self-care tasks, household tasks, engagement in social activity, support from family and friends, arthritis pain, work, level of tension, and mood. Once the participants have completed the six-week program, completion of the AIMS2 will be requested again. The AIMS2 takes about 20 minutes to complete. Thus, the exercise group's participation will include approximately 13 hours during the six-week period of the study. A control group will be used, if available, and these individuals will be asked to complete the AIMS2 at the same two times as the exercise group. Therefore, the control group's participation will include about 40 minutes in total.

6. **Ethical Issues – Description**

a) Risks of Participation: Since this is an exercise program, there are potential physical risks including orthopedic, muscular, and cardiovascular. However, the pool environment minimizes these risks. Due to the buoyancy of the water, up to 90% of a person's body weight is supported by the water, thus reducing the stress on the joints. The AFYAP procedures will be strictly adhered in order to minimize possible physical, emotional, and/or social risks. The participants of the AFYAP classes are asked to perform the exercises within their level of comfort. If part of the exercise program could possibly put someone at risk due to a medical condition or recent surgery (such as a hip joint replacement) he or she will not be permitted to do that particular movement (in accordance with the AFYAP protocols). The AFYAP prescribed exercises are slow rhythmical movements, which also decreases the physical risks such as muscle strain. The subjects will monitor their own intensity using the Borg Rate of Perceived Exertion Scale. This will be used every 20 minutes in each class (3 times per class session) and an individual will be asked to stop if the intensity is too high. Additionally, each subject will be cleared by his or her physician prior to participating in the aquatic classes.

A certified lifeguard will be on duty during the class sessions to ensure maximum water safety. The lifeguards will be recruited from the college and will be asked to volunteer their services. Currently, there are several Ithaca College students who volunteer their lifeguarding services at Longview. If a lifeguard is not available for a scheduled class session, the session will be cancelled and rescheduled.

Some of the questions on the AIMS2 discuss sensitive topics. The participants will be informed that they are free to omit any answers that they do not feel comfortable answering. Additionally, risks will be minimized by the participants possession of the right to withdraw from the study at any time and each participant can chose not to answer any of the questions in the AIMS2.

The risk involved for the individuals in the control group is rather small. Measures will be taken to ensure confidentiality, which are discussed below. These subjects will also be informed that they can withdraw at any time and can omit any questions on the AIMS2 that they do not feel comfortable answering.

b) Informed Consent: The Informed Consent Forms are attached. A separate informed consent form was developed for the exercise and the control groups since the risks of participation are different for each. Each subject will be given a copy of the informed consent form.

7. **Recruitment of Subjects**

   a) Recruitment Procedures: The subjects will be recruited from Longview through two informational sessions that will be conducted. The informational sessions will be advertised in the Longview newsletter and on the bulletin boards around the site. The recruiting sessions will explain the project, including the survey and the class sessions. The first twelve individuals who sign up to participate in the study who have arthritis and are able to attend the scheduled class sessions will be included in the program. Individuals who meet the inclusion and exclusion criteria, but do not wish to participate in the class for various reasons such as time constraints will be asked to be members of the control group. Please see the attached flyer that will be used.

   b) Inducement to Participate: There is no inducement to participate in this study.

8. **Confidentiality/Anonymity of Responses**

   To ensure confidentiality, the collected data will be kept in a locked filing cabinet in the researcher's apartment. Once the pre and posttests are collated for each subject, the identifying information will be destroyed. After the data is analyzed, the completed AIMS2 will be destroyed.

9. **Debriefing**

   When the six-week program is completed, a meeting will be held with the exercise and with the control group to discuss the study. The purpose of the study will be discussed again and participants' questions will be answered. Since deception is not involved in this study, a specific debriefing statement does not need to be developed.

10. **Compensatory Follow-up**

    Subjects will be referred to their physician if any physical harm results from engaging in this study. If the subjects of the exercise group wish to continue attending aquatic classes or if the subjects of the control group wish to join an aquatic class for individuals with arthritis, they will be referred to similar programs that are held in the community and at Longview.

INFORMED CONSENT FORM
(For participants engaging in the aquatic program.)

Determining the Benefits of an Aquatic Program for Individuals with Arthritis

1. Purpose of the Study: This study is being conducted to determine if an individual with arthritis can gain benefits from participating in an aquatic exercise program. Benefits will be looked at in the areas of engagement in functional or everyday activities, physical, emotional, and social wellbeing.

2. Benefits of the Study: The participants in the study may receive the following benefits: increased range of motion, ability to perform daily activities, social interaction, mood, and decreased pain. This study may show that aquatic movement programs are an efficient and effective way of treating individuals with arthritis. Thus, expanding the possible use of aquatic programs in occupational therapy and contributing to the knowledge of the profession.

3. What You Will Be Asked to Do: Written permission from your doctor is required before participating in this program. This may require a physical. If you chose to participate, you will be asked to attend twelve aquatic exercise classes at the pool in Longview between January 17, 2000 and February 25, 2000. Each class session will last approximately 60 minutes. The instructor, Alison Eisnor is certified to lead classes that follow the Arthritis Foundation YMCA Aquatic Program (AFYAP) guidelines. The intensity level of the program is relatively low, the focus is on slow, sustained stretching exercises. Before the classes start you will be asked to complete the Arthritis Impact Measurement Scale 2 (AIMS2) which asks questions on the following topics: mobility level, ability to walking and bend, hand and finger functioning, arm function, ability to perform self-care tasks, household tasks, engagement in social activity, support from family and friends, arthritis pain, work, level of tension, and mood. Each question is answered by checking off on a scale of 1 to 5. This questionnaire takes approximately 20 minutes to complete.

4. Risks: Since this is an exercise program performed in a pool environment, the possible physical risks include those you might expect from swimming. The pool deck may be slippery or rough, so you should wear no-slip aquatic shoes to decrease the risk of falls or injuring the soles of your feet. You may experience skin allergies from the chemicals used in the pool. You may experience soreness from the exercises, but stretches will be performed to minimize this. The water will be at least 83°F to reduce the risk of feeling cold. You should shower and wear warm clothes home after each class to reduce the chances of catching a chill. Additionally, you may feel uncomfortable answering some of the questions in the AIMS2.

5. If You Would Like More Information about the Study: If you would like more information on this study, either before, during, or after the study, you may contact myself, Alison Eisnor, at (607)275-8095 or through email at aeisnor1@ic3.ithaca.edu. Also, please feel free to contact my supervising professor, Carol Knight at (607)274-1374 or through email at cknight@ithaca.edu.

_____
(Please write your initials here)

6. Withdrawal from the Study: Any participant is free to withdraw from the study at any time without penalty. You also have the right to omit answers to any of the questions that you feel uncomfortable answering.

7. How the Data will be Maintained in Confidence: All data that is collected through the AIMS2 will be kept in complete confidence. That is, you can be assured that all the information that you give to the researcher will be kept secret and will not be available to anyone other than the researcher. Once the data has been analyzed and all identifying factors are removed from the data the completed AIMS2 will be destroyed.

I have read the above and I understand its contents. I agree to participate in the study.

_____

Print or Type Name

_____ _____

Signature Date

INFORMED CONSENT FORM
(For participants filling out the AIMS2 and not participating in the aquatic classes.)

Determining the Benefits of an Aquatic Program for Individuals with Arthritis

1. Purpose of the Study: This study is being conducted to determine if an individual with arthritis can gain benefits from participating in an aquatic exercise program. Benefits will be looked at in the areas of engagement in functional or everyday activities, physical, emotional, and social wellbeing.

2. Benefits of the Study: This study may show that aquatic movement programs are an efficient and effective way of treating individuals with arthritis. Thus, expanding the possible use of aquatic programs in occupational therapy and contributing to the knowledge of the profession.

3. What You Will Be Asked to Do: If you chose to participate, you will be asked to complete the Arthritis Impact Measurement Scale 2 (AIMS2) which asks questions on the following topics: mobility level, ability to walking and bend, hand and finger functioning, arm function, ability to perform self-care tasks, household tasks, engagement in social activity, support from family and friends, arthritis pain, work, level of tension, and mood. Each question is answered by checking off on a scale of 1 to 5. This questionnaire takes approximately 20 minutes to complete. You will be asked to complete this survey six weeks later as well.

4. Risks: The risks are fairly minimal, but you may feel uncomfortable answering some of the questions in the AIMS2.

5. If You Would Like More Information about the Study: If you would like more information on this study, either before, during, or after the study, you may contact myself, Alison Eisnor, at (607)275-8095 or through email at aeisnor1@ic3.ithaca.edu. Also, please feel free to contact my supervising professor, Carol Knight at (607)274-1374 or through email at cknight@ithaca.edu.

6. Withdrawal from the Study: Any participant is free to withdraw from the study at any time without penalty. You also have the right to omit answers to any of the questions that you feel uncomfortable answering.

7. How the Data will be Maintained in Confidence: All data that is collected through the AIMS2 will be kept in complete confidence. That is, you can be assured that all the information that you give to the researcher will be kept secret and will not be available to anyone other than the researcher. Once the data has been analyzed and all identifying factors are removed from the data the completed AIMS2 will be destroyed.

I have read the above and I understand its contents. I agree to participate in the study.

_____
Print or Type Name

_____ _____
Signature Date

NEW AQUATIC EXERCISE CLASS!

Informational Meeting & Sign up will be
Thursday January 13th
at 2:15
in the Auditorium

A 6 week program for individuals with arthritis
who have not and are not currently participating ....

Program runs January 18th – February 23rd

Space for 12 participants,
all participants must have physician sign consent form

Class instructor: Alison Eisnor
Occupational Therapy Graduate Student at Ithaca College
If you have any questions, please feel free to call
275-8095

Debriefing Statement

The purpose of this study is to determine the benefits of an aquatic exercise program for individual's with arthritis. Those who participated in the class attended two classes a week for the six-week period. The class followed the guidelines and protocols set by the Arthritis Foundation and YMCA Aquatic Program (AFYAP). Those who were in the other group did not partake in an aquatic exercise class.

If you wish to continue taking aquatic exercise classes or wish to start, classes are held at Longview on Mondays and Thursdays from 10 to 11 am. They are also held throughout the week at the ITHACA YMCA.

Thank you for your participation in this study. If you have any questions please feel free to call me at 275-8095 or email me at aeisnor1@ic3.ithace.edu

ALL-COLLEGE REVIEW BOARD
FOR
HUMAN SUBJECTS RESEARCH

EXPEDITED REVIEW

Addendum to

Project Title: Determining the Benefits of an Aquatic Program for Individual with Arthritis

Investigator: Alison Eisnor
Department: Occupational Therapy
Address: 88 Hudson Heights
Ithaca, NY 14850
Telephone: (607)275-8095
Faculty Advisor: Carol Knight, M.Ed., OTR/L

7. **Recruitment of Subjects**
   a) **Recruitment Procedures:** In addition to the previous recruitment procedures, subjects will also be recruited from a preexisting aquatic class at Longview that is conducted by a Longview Resident. The instructor of the preexisting class is a certified instructor by the Arthritis Foundation YMCA Aquatic Program (AFYAP). The participants have been engaged in this preexisting class since September of 1999. The participants were not required to obtain their physician's approval prior to starting the class, but their continuous participation in the class for the past five months proves their fitness to continue in this class. Members of the class will also be asked to ask other Longview residents who have arthritis, but are not participating in an aquatic exercise class to fill out the Arthritis Impact Measurement Scale 2 (AIMS2) as part of the control group. Additional recruitment efforts are needed because I did not obtain the amount of participants needed for statistical purposes.

   b) **Inducement to Participate:** There is no inducement to participate.

Please see attached Informed Consent Form for this new set of subjects. (Though the recruitment procedures of the control group are expanded the same control group Informed Consent Form will be used since items 1-7 on the consent form remain the same.)

INFORMED CONSENT FORM
(For participants engaging in the preexisting aquatic program.)

Determining the Benefits of an Aquatic Program for Individuals with Arthritis

8. Purpose of the Study: This study is being conducted to determine if an individual with arthritis can gain benefits from participating in an aquatic exercise program. Benefits will be looked at in the areas of engagement in functional or everyday activities, physical, emotional, and social wellbeing.

9. Benefits of the Study: The participants in the study may receive the following benefits: increased range of motion, ability to perform daily activities, social interaction, mood, and decreased pain. This study may show that aquatic movement programs are an efficient and effective way of treating individuals with arthritis. Thus, expanding the possible use of aquatic programs in occupational therapy and contributing to the knowledge of the profession.

10. What You Will Be Asked to Do: If you chose to participate, you will be asked to attend twelve aquatic exercise classes at the pool in Longview between January 31, 2000 and March 9, 2000. Each class session will last approximately 60 minutes. The instructor is certified to lead classes that follow the Arthritis Foundation YMCA Aquatic Program (AFYAP) guidelines. The intensity level of the program is relatively low, the focus is on slow, sustained stretching exercises. Before the classes start you will be asked to complete the Arthritis Impact Measurement Scale 2 (AIMS2) which asks questions on the following topics: mobility level, ability to walking and bend, hand and finger functioning, arm function, ability to perform self-care tasks, household tasks, engagement in social activity, support from family and friends, arthritis pain, work, level of tension, and mood. Each question is answered by checking off on a scale of 1 to 5. Once you have completed twelve classes, you will be asked to complete the AIMS2 again. This questionnaire takes approximately 20 minutes to complete.

11. Risks: Since this is an exercise program performed in a pool environment, the possible physical risks include those you might expect from swimming. The pool deck may be slippery or rough, so you should wear no-slip aquatic shoes to decrease the risk of falls or injuring the soles of your feet. You may experience skin allergies from the chemicals used in the pool. You may experience soreness from the exercises, but stretches will be performed to minimize this. The water will be at least 83°F to reduce the risk of feeling cold. You should shower and wear warm clothes home after each class to reduce the chances of catching a chill. Additionally, you may feel uncomfortable answering some of the questions in the AIMS2.

12. If You Would Like More Information about the Study: If you would like more information on this study, either before, during, or after the study, you may contact myself, Alison Eisnor, at (607)275-8095 or through email at aeisnor1@ic3.ithaca.edu. Also, please feel free to contact my supervising professor, Carol Knight at (607)274-1374 or through email at cknight@ithaca.edu.

_____
(Please write your initials here)

13. Withdrawal from the Study: Any participant is free to withdraw from the study at any time without penalty. You also have the right to omit answers to any of the questions that you feel uncomfortable answering.

14. How the Data will be Maintained in Confidence: All data that is collected through the AIMS2 will be kept in complete confidence. That is, you can be assured that all the information that you give to the researcher will be kept secret and will not be available to anyone other than the researcher. Once the data has been analyzed and all identifying factors are removed from the data the completed AIMS2 will be destroyed.

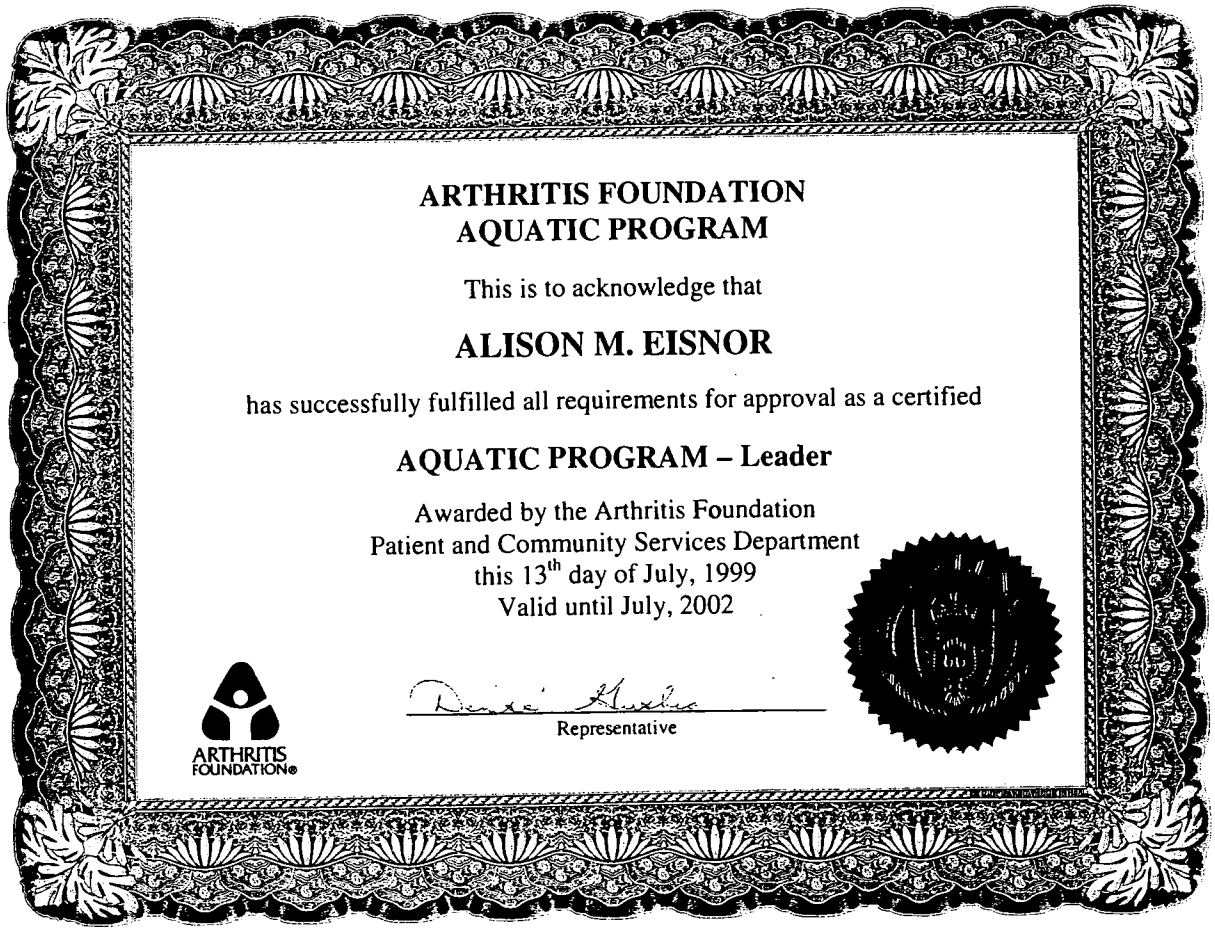
I have read the above and I understand its contents. I agree to participate in the study.

_____

Print or Type Name

_____ _____

Signature Date



ARTHRITIS FOUNDATION
AQUATIC PROGRAM

This is to acknowledge that

ALISON M. EISNOR

has successfully fulfilled all requirements for approval as a certified

AQUATIC PROGRAM – Leader

Awarded by the Arthritis Foundation
Patient and Community Services Department
this 13th day of July, 1999
Valid until July, 2002

ARTHRITIS FOUNDATION®

Representative

ARTHRITIS FOUNDATIO

CENTRAL NEW YORK CHAPTER

5858 EAST MOLLOY ROAD, SUITE 123 • SYRACUSE, NEW YORK 13211-2002

PHONE 315/455-8553 or 800/870-1771 • FAX 315/455-8714

November 17, 1999

Dear Sir/Madam:

I give Alison Eisnor permission to use her certification as an Arthritis Foundation YMCA Aquatic Program (AFYAP) leader to run classes at the Longview pool in Ithaca, New York. Her certification will be completed by December 1, 1999. By using this certification, Alison is required to follow the guidelines and procedures of the AFYAP program. Since she is not a certified lifeguard, a certified lifeguard will be required to be on the deck of the pool during the class sessions. I understand that this is part of her thesis research project for her graduate degree at Ithaca College in Occupational Therapy, therefore the participants will not be charged for the classes. The Arthritis Foundation will not be held liable for anything pertaining to this research project.

Denise Gushea, Program Director

Longview
an Ithacare community

November 15, 1999

Dear Alison Eisnor,

This is a letter to confirm our conversation on November 15, 1999. You have my permission to use the Longview Pool to do your Aquatic Exercise Program with your AFYAP certification. The program will run for 6 weeks throughout the months of January and February 2000 and will be part of your thesis project required for graduation.

You will be responsible for obtaining a certified lifeguard to guard the pool during the hours of your program. Your lifeguard must have current certification and a copy must be presented to me before the program begins.

The Human Subjects Board will review your proposal, and it is my understanding that Longview will not be held liable in the event of any emergency.

Sincerely,

Amy L. Carrier
Director of Recreation and
Volunteer Coordinator
375-6335

1 Bella Vista Drive • Ithaca, NY 14850
phone: 607.375.6300 • fax: 607.375.6301

Appendix B

My name is Alison Eisnor and I am an occupational therapy graduate student at Ithaca College. I am certified by the Arthritis Foundation to instruct aquatic exercise classes. I am starting up a new class at Longview as part of my graduate research. The Human Subjects Review Board at Ithaca College has accepted my study and I am required by this board to obtain each participant's physician's consent before he or she begins the class. If you agree to allow your patient to participate in this class, please sign the form on the next page and I will pick it up in a day or so. If you have any questions or concerns, please feel free to contact me at 275-8095. Thank you for your time and consideration.

Arthritis Foundation YMCA Aquatic Program (AFYAP)
Diagnosis Verification Form

Note to the Doctor:

The Arthritis Foundation is collaborating with Longview to conduct the Arthritis Foundation YMCA Aquatic Program. This series of recreational warm-water pool activities will be led by trained personnel and will cover a period of 10 weeks. This program has been approved by the Arthritis Foundation Chapter's Medical and Scientific Committee.

Your patient, (named below), has indicated an interest in participating in this program. In order for him or her to do so, we ask that you please fill out this form which he or she will return to us.

The program consists of range-of-motion, muscle strengthening, and endurance-building activities. Persons with total joint replacements, multiple joint involvement, or moderate to severe joint involvement may require individualized instruction by a physical or occupational therapist. If your patient requires this instruction, you may want to refer him or her to a therapist prior to participation in the program.

Part I: For class applicant to complete

1. Print name _____

2. I give permission to Dr. _____ to complete this AFYAP Diagnosis Verification Form.

_____ _____

Your signature *Date*

Part II: For physician to complete

1. My patient, named above, has the following type of arthritis/rheumatic disease:

_____

_____ _____

Physician's signature *Date*

Please print or stamp address here:

_____

_____

_____

Appendix C

TABLE 4-6. Category and Category-Ratio Scales for Ratings of Perceived Exertion (RPE)*

Category Scale		Category-Ratio Scale		
6		0	Nothing at all	"No I"
7	Very, very light	0.3		
8		0.5	Extremely weak	Just noticeable
9	Very light	0.7		
10		1	Very weak	
11	Fairly light	1.5		
12		2	Weak	Light
13	Somewhat hard	2.5		
14		3	Moderate	
15	Hard	4		
16		5	Strong	Heavy
17	Very hard	6		
18		7	Very strong	
19	Very, very hard	8		
20		9		
		10	Extremely strong	"Strongest I"
		11		
		•	Absolute maximum	Highest possible

*Copyright Gunnar Borg. Reproduced with permission.
Note: On the Category-Ratio Scale, "I" represents intensity.
For correct usage of the Borg scales, it is necessary to follow the administration and instructions given in Borg G. Borg's Perceived Exertion and Pain Scales. Champaign, IL: Human Kinetics, 1998.

(American College of Sports Medicine, 2000, p. 79)

Appendix D

ARTHRITIS IMPACT MEASUREMENT SCALES 2 (AIMS2)

Instructions: Please answer the following questions about your health. Most questions ask about your health during the past month. There are no right or wrong answers to the questions and most can be answered with a simple check (X).

Please begin by providing the following information about yourself.

NAME: _____

ADDRESS: _____
Number Street Apt#

_____
City State Zip

PHONE: _____ TODAY'S DATE: _____
Area Code Number Month Day Year

AIMS

Please check (X) the most appropriate answer for each question.

These questions refer to **MOBILITY LEVEL.**

DURING THE PAST MONTH...	All Days (1)	Most Days (2)	Some Days (3)	Few Days (4)	No Days (5)	
1. How often were you physically able to drive a car or use public transportation?	____	____	____	____	____	8/
2. How often were you out of the house for at least part of the day?	____	____	____	____	____	9/
3. How often were you able to do errands in the neighborhood?	____	____	____	____	____	10/
4. How often did someone have to assist you to get around outside your home?	____	____	____	____	____	11/
5. How often were you in a bed or chair for most or all of the day?	____	____	____	____	____	12/

. . . . . .

AIMS

These questions refer to **WALKING AND BENDING.**

DURING THE PAST MONTH...	All Days (1)	Most Days (2)	Some Days (3)	Few Days (4)	No Days (5)	
6. Did you have trouble doing vigorous activities such as running, lifting heavy objects, or participating in strenuous sports?	____	____	____	____	____	13/
7. Did you have trouble either walking several blocks or climbing a few flights of stairs?	____	____	____	____	____	14/
8. Did you have trouble bending, lifting or stooping?	____	____	____	____	____	15/
9. Did you have trouble either walking one block or climbing one flight of stairs?	____	____	____	____	____	16/
10. Were you unable to walk unless assisted by another person or by a cane, crutches, or walker?	____	____	____	____	____	17/

AIMS

Please check (X) the most appropriate answer for each question.

These questions refer to **HAND AND FINGER FUNCTION.**

DURING THE PAST MONTH...	All Days (1)	Most Days (2)	Some Days (3)	Few Days (4)	No Days (5)	
11. Could you easily write with a pen or pencil?	____	____	____	____	____	18/
12. Could you easily button a shirt or blouse?	____	____	____	____	____	19/
13. Could you easily turn a key in a lock?	____	____	____	____	____	20/
14. Could you easily tie a knot or a bow?	____	____	____	____	____	21/
15. Could you easily open a new jar of food?	____	____	____	____	____	22/

AIMS

These questions refer to **ARM FUNCTION.**

DURING THE PAST MONTH...	All Days (1)	Most Days (2)	Some Days (3)	Few Days (4)	No Days (5)	
16. Could you easily wipe your mouth with a napkin?	____	____	____	____	____	23/
17. Could you easily put on a pullover sweater?	____	____	____	____	____	24/
18. Could you easily comb or brush your hair?	____	____	____	____	____	25/
19. Could you easily scratch your low back with your hand?	____	____	____	____	____	26/
20. Could you easily reach shelves that were above your head?	____	____	____	____	____	27/

AIMS

Please check (X) the most appropriate answer for each question.

These questions refer to **SELF-CARE TASKS.**

DURING THE PAST MONTH...	Always (1)	Very Often (2)	Sometimes (3)	Almost Never (4)	Never (5)	
21. Did you need help to take a bath or shower?	____	____	____	____	____	28/
22. Did you need help to get dressed?	____	____	____	____	____	29/
23. Did you need help to use the toilet?	____	____	____	____	____	30/
24. Did you need help to get in or out of bed?	____	____	____	____	____	31/

. . . . . .

AIMS

These questions refer to **HOUSEHOLD TASKS.**

DURING THE PAST MONTH...	Always (1)	Very Often (2)	Sometimes (3)	Almost Never (4)	Never (5)	
25. If you had the necessary transportation, could you go shopping for groceries without help?	____	____	____	____	____	32/
26. If you had kitchen facilities, could you prepare your own meals without help?	____	____	____	____	____	33/
27. If you had household tools and appliances, could you do your own housework without help?	____	____	____	____	____	34/
28. If you had laundry facilities, could you do your own laundry without help?	____	____	____	____	____	35/

AIMS

Please check (X) the most appropriate answer for each question.

These questions refer to SOCIAL ACTIVITY.

DURING THE PAST MONTH...	All Days (1)	Most Days (2)	Some Days (3)	Few Days (4)	No Days (5)	
29. How often did you get together with friends or relatives?	____	____	____	____	____	36/
30. How often did you have friends or relatives over to your home?	____	____	____	____	____	37/
31. How often did you visit friends or relatives at their homes?	____	____	____	____	____	38/
32. How often were you on the telephone with close friends or relatives?	____	____	____	____	____	39/
33. How often did you go to a meeting of a church, club, team or other group?	____	____	____	____	____	40/

AIMS

These questions refer to SUPPORT FROM FAMILY AND FRIENDS.

DURING THE PAST MONTH...	Always (1)	Very Often (2)	Sometimes (3)	Almost Never (4)	Never (5)	
34. Did you feel that your family or friends would be around if you needed assistance?	____	____	____	____	____	41/
35. Did you feel that your family or friends were sensitive to your personal needs?	____	____	____	____	____	42/
36. Did you feel that your family or friends were interested in helping you solve problems?	____	____	____	____	____	43/
37. Did you feel that your family or friends understood the effects of your arthritis?	____	____	____	____	____	44/

AIMS

Please check (X) the most appropriate answer for each question.

These questions refer to **ARTHRITIS PAIN.**

DURING THE PAST MONTH...	Severe (1)	Moderate (2)	Mild (3)	Very Mild (4)	None (5)	
38. How would you describe the arthritis pain you usually had?	____	____	____	____	____	45/

	All Days (1)	Most Days (2)	Some Days (3)	Few Days (4)	No Days (5)	
39. How often did you have severe pain from your arthritis?	____	____	____	____	____	46/
40. How often did you have pain in two or more joints at the same time?	____	____	____	____	____	47/
41. How often did your morning stiffness last more than one hour from the time you woke up?	____	____	____	____	____	48/
42. How often did your pain make it difficult for you to sleep?	____	____	____	____	____	49/

. . . . . .

AIMS

These questions refer to **WORK.**

DURING THE PAST MONTH...	Paid work (1)	House work (2)	School work (3)	Unemployed (4)	Disabled (5)	Retired (6)	
43. What has been your main form of work?	____	____	____	____	____	____	50/

If you answered unemployed, disabled or retired, please skip the next four questions and go to the next page.

DURING THE PAST MONTH...	All Days (1)	Most Days (2)	Some Days (3)	Few Days (4)	No Days (5)	
44. How often were you unable to do any paid work, housework or school work?	____	____	____	____	____	51/
45. On the days that you did work, how often did you have to work a shorter day?	____	____	____	____	____	52/
46. On the days that you did work, how often were you unable to do your work as carefully and accurately as you would like?	____	____	____	____	____	53/
47. On the days that you did work, how often did you have to change the way your paid work, housework or school work is usually done?	____	____	____	____	____	54/

AIMS

Please check (X) the most appropriate answer for each question.

These questions refer to **LEVEL OF TENSION.**

DURING THE PAST MONTH...	Always (1)	Very Often (2)	Sometimes (3)	Almost Never (4)	Never (5)	
48. How often have you felt tense or high strung?	____	____	____	____	____	55/
49. How often have you been bothered by nervousness or your nerves?	____	____	____	____	____	56/
50. How often were you able to relax without difficulty?	____	____	____	____	____	57/
51. How often have you felt relaxed and free of tension?	____	____	____	____	____	58/
52. How often have you felt calm and peaceful?	____	____	____	____	____	59/

AIMS

These questions refer to **MOOD.**

DURING THE PAST MONTH...	Always (1)	Very Often (2)	Sometimes (3)	Almost Never (4)	Never (5)	
53. How often have you enjoyed the things you do?	____	____	____	____	____	60/
54. How often have you been in low or very low spirits?	____	____	____	____	____	61/
55. How often did you feel that nothing turned out the way you wanted it to?	____	____	____	____	____	62/
56. How often did you feel that others would be better off if you were dead?	____	____	____	____	____	63/
57. How often did you feel so down in the dumps that nothing would cheer you up?	____	____	____	____	____	64/

Please check (X) the most appropriate answer for each question.

These questions refer to SATISFACTION WITH EACH HEALTH AREA.

DURING THE PAST MONTH...	Very Satisfied (1)	Somewhat Satisfied (2)	Neither Satisfied Nor Dis-satisfied (3)	Somewhat Dissatisfied (4)	Very Dis-satisfied (5)	
58. How satisfied have you been with each of these areas of your health?						
MOBILITY LEVEL (example: do errands)	____	____	____	____	____	65/
WALKING AND BENDING (example: climb stairs)	____	____	____	____	____	66/
HAND AND FINGER FUNCTION (example: tie a bow)	____	____	____	____	____	67/
ARM FUNCTION (example: comb hair)	____	____	____	____	____	68/
SELF-CARE (example: take bath)	____	____	____	____	____	69/
HOUSEHOLD TASKS (example: housework)	____	____	____	____	____	70/
SOCIAL ACTIVITY (example: visit friends)	____	____	____	____	____	71/
SUPPORT FROM FAMILY (example: help with problems)	____	____	____	____	____	72/
ARTHRITIS PAIN (example: joint pain)	____	____	____	____	____	73/
WORK (example: reduce hours)	____	____	____	____	____	74/
LEVEL OF TENSION (example: felt tense)	____	____	____	____	____	75/
MOOD (example: down in dumps)	____	____	____	____	____	76/

Please check (X) the most appropriate answer for each question.

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

DURING THE PAST MONTH...	Not A Problem For Me (0)	Due Entirely To Other Causes (1)	Due Largely To Other Causes (2)	Due Partly To Arthritis And Partly To Other Causes (3)	Due Largely To My Arthritis (4)	Due Entirely To My Arthritis (5)	
59. How much of your problem in each area of health was due to your arthritis?							
MOBILITY LEVEL (example: do errands)	____	____	____	____	____	____	8/
WALKING AND BENDING (example: climb stairs)	____	____	____	____	____	____	9/
HAND AND FINGER FUNCTION (example: tie a bow)	____	____	____	____	____	____	10/
ARM FUNCTION (example: comb hair)	____	____	____	____	____	____	11/
SELF-CARE (example: take bath)	____	____	____	____	____	____	12/
HOUSEHOLD TASKS (example: housework)	____	____	____	____	____	____	13/
SOCIAL ACTIVITY (example: visit friends)	____	____	____	____	____	____	14/
SUPPORT FROM FAMILY (example: help with problems)	____	____	____	____	____	____	15/
ARTHRITIS PAIN (example: joint pain)	____	____	____	____	____	____	16/
WORK (example: reduce hours)	____	____	____	____	____	____	17/
LEVEL OF TENSION (example: felt tense)	____	____	____	____	____	____	18/
MOOD (example: down in dumps)	____	____	____	____	____	____	19/

AIMS

You have now answered questions about different AREAS OF YOUR HEALTH. These areas are listed below. Please check (X) UP to THREE AREAS in which you would MOST LIKE TO SEE IMPROVEMENT. Please read all 12 areas of health choices before making your decision:

check = 1
blank = 0

60. AREAS OF HEALTH	THREE AREAS FOR IMPROVEMENT	
MOBILITY LEVEL (example: do errands)	_____	20/
WALKING AND BENDING (example: climb stairs)	_____	21/
HAND AND FINGER FUNCTION (example: tie a bow)	_____	22/
ARM FUNCTION (example: comb hair)	_____	23/
SELF-CARE (example: take bath)	_____	24/
HOUSEHOLD TASKS (example: housework)	_____	25/
SOCIAL ACTIVITY (example: visit friends)	_____	26/
SUPPORT FROM FAMILY (example: help with problems)	_____	27/
ARTHRITIS PAIN (example: joint pain)	_____	28/
WORK (example: reduce hours)	_____	29/
LEVEL OF TENSION (example: felt tense)	_____	30/
MOOD (example: down in dumps)	_____	31/

Please make sure that you have checked no more than THREE AREAS for improvement.

Please check (X) the most appropriate answer for each question.

These questions refer to your CURRENT and FUTURE HEALTH.

	Excellent (1)	Good (2)	Fair (3)	Poor (4)	
61. In general would you say that your HEALTH NOW is excellent, good, fair or poor?	____	____	____	____	64/

	Very Satisfied (1)	Somewhat Satisfied (2)	Neither Satisfied Nor Dis-satisfied (3)	Somewhat Dissatisfied (4)	Very Dis-satisfied (5)	
62. How satisfied are you with your HEALTH NOW?	____	____	____	____	____	32/

	Not A Problem For Me (0)	Due Entirely To Other Causes (1)	Due Largely To Other Causes (2)	Due Partly To Arthritis And Partly To Other Causes (3)	Due Largely To My Arthritis (4)	Due Entirely To My Arthritis (5)	
63. How much of your problem with your HEALTH NOW is due to your arthritis?	____	____	____	____	____	____	34/

	Excellent (1)	Good (2)	Fair (3)	Poor (4)	
64. In general do you expect that your HEALTH 10 YEARS FROM NOW will be excellent, good, fair or poor?	____	____	____	____	35/

	No Problem At All (1)	Minor Problem (2)	Moderate Problem (3)	Major Problem (4)	
65. How big a problem do you expect your arthritis to be 10 YEARS FROM NOW?	____	____	____	____	36/

Please check (X) the most appropriate answer for each question.

This question refers to **OVERALL ARTHRITIS IMPACT.**

	Very Well (1)	Well (2)	Fair (3)	Poor (4)	Very Poorly (5)	
66. CONSIDERING ALL THE WAYS THAT YOUR ARTHRITIS AFFECTS YOU, how well are you doing compared to other people your age?	____	____	____	____	____	37/

67. What is the main kind of arthritis that you have?

check = 1
blank = 0

Rheumatoid Arthritis	_____	38/
Osteoarthritis/Degenerative Arthritis	_____	39/
Systemic Lupus Erythematosis	_____	40/
Fibromyalgia	_____	41/
Scleroderma	_____	42/
Psoriatic Arthritis	_____	43/
Reiter's Syndrome	_____	44/
Gout	_____	45/
Low Back Pain	_____	46/
Tendonitis/Bursitis	_____	47/
Osteoporosis	_____	48/
Other	_____	49/

68. How many years have you had arthritis? _____ 50–51/

. . . . . .

DURING THE PAST MONTH...	All Days (1)	Most Days (2)	Some Days (3)	Few Days (4)	No Days (5)	
69. How often have you had to take MEDICATION for your arthritis?	____	____	____	____	____	52/

Please check (X) yes or no for each question.

70. Is your health currently affected by any of the following medical problems?

	Yes (1)	No (2)	
High blood pressure	_____	_____	53/
Heart disease	_____	_____	54/
Mental illness	_____	_____	55/
Diabetes	_____	_____	56/
Cancer	_____	_____	57/
Alcohol or drug use	_____	_____	58/
Lung disease	_____	_____	59/
Kidney disease	_____	_____	60/
Liver disease	_____	_____	61/
Ulcer or other stomach disease	_____	_____	62/
Anaemia or other blood disease	_____	_____	63/

	Yes (1)	No (2)	
71. Do you take medicine every day for any problem other than your arthritis?	_____	_____	64/
72. Did you see a doctor more than three times last year for any problem other than arthritis?	_____	_____	65/

Please provide the following information about yourself:

73. What is your age at this time? _____ 66–67/

74. What is your sex?

Male (1) _____ 68/
Female (2) _____

75. What is your racial background?

White (1) _____ 69/
Black (2) _____
Hispanic (3) _____
Asian or Pacific Islander (4) _____
American Indian or Alaskan Native (5) _____
Other (6) _____

76. What is your current marital status?

Married (1) _____ 70/
Separate (2) _____
Divorced (3) _____
Widowed (4) _____
Never married (5) _____

77. What is the highest level of education you received? 71/

Less than seven years of school (1) _____
Grades seven through nine (2) _____
Grades ten through eleven (3) _____
High school graduate (4) _____
One to four years of college (5) _____
College graduate (6) _____
Professional or graduate school (7) _____

78. What is your approximate family income including wages, disability payment, retirement income and welfare? 72/

Less than $10,000 (1) _____
$10,000–$19,999 (2) _____
$20,000–$29,999 (3) _____
$30,000–$39,999 (4) _____
$40,000–$49,999 (5) _____
$50,000–$59,999 (6) _____
$60,000–$69,999 (7) _____
More than $70,000 (8) _____

Thank you for completing this questionnaire.

Appendix E

AIMS2 USER'S GUIDE

BOSTON UNIVERSITY ARTHRITIS CENTER

The second version of the Arthritis Impact Measurement Scales (AIMS2) is an improvement on an evaluation instrument that was developed to measure patient outcome in the rheumatic diseases. The AIMS2 instrument is designed to measure the health status component of outcome in a multidimensional fashion using specific scales, summary components, and overall impact measures. The scaling properties, reliability and validity of the AIMS and AIMS2 approaches have been documented and the results have appeared in the literature (Arthritis Rheum 23: 146-152, 1980; Arthritis Rheum 25: 1048-1053, 1982; Arthritis Rheum 35: 1-10, 1992). The AIMS approach has proven useful for assessing the outcome of various treatments and programs in the rheumatic diseases (Arthritis Rheum 27: 1344-1352, 1984). The purpose of this Guide is to provide a brief summary of content and scoring for those who wish to employ the AIMS2 instrument.

Content

The current AIMS2 instrument is a 78 item questionnaire. The first 57 items are broken down into 12 scales: Mobility Level, Walking and Bending, Hand and Finger Function, Arm Function, Self-Care Tasks, Household Tasks, Social Activity, Support from Family and Friends, Arthritis Pain, Work, Level of Tension, and Mood. The number of items in each scale is either 4 or 5. The specific items which make up each scale are shown in Table 1. Item 58 concerns respondent satisfaction with each of the 12 health status scales. Item 59 asks respondents to report how much of their problem with any of these twelve areas is attributable to arthritis. Item 60 asks the patient to prioritize the 3 areas in which he or she would most like to see improvement. Items 61-65 ascertain general perceptions of current and future health. Item 66 estimates the overall impact of arthritis. Items 67 and 68 allow the patient to identify the type and duration of her or his arthritis. Item 69 provides an estimate of medication usage. Items 70-72 explore for comorbidity, and items 73-78 deal with demographics.

Administration

The AIMS2 instrument is self-administered. Subjects should simply be given the questionnaire and asked to complete it. We suggest that they not be given any coaching since it may bias the results. Our analyses have shown that most patients, even in low socio-economic groups, have very little trouble understanding the questionnaire. AIMS2 takes approximately 20 minutes to complete.

Scoring

The AIMS scales are scored in a consistent fashion so that a low value indicates a high health status. In order to avoid systematic response biases, however, the response arrangements of the questionnaire are mixed so that the last response will not always indicate poor health status. Thus a number of items must be recoded in the proper direction before the scale can be calculated. The recoded items and the direction of the recodes are indicated in Table 1.

Once the raw responses have been recoded, the scores of each item within the scale are simply added. The range of scores depends upon the number of items in the scale. The score range for each scale is shown in Table 1. In order to express these scores in similar units, a normalization procedure is then performed so that all scores can be expressed in the range 0-10, with 0 representing good health status and 10 representing poor status. In this way, 12 health status scale scores ranging from 0-10 can be obtained. An overall satisfaction scale may also be computed from the response to item 58. The scoring of this scale is also included in Table 1.

It is important to note however, that the scalability, reliability, and validity of the scales are based upon the assumption that all items within the scale have been answered. If items within a given scale are omitted, then the score for the scale cannot accurately be calculated using these normalization procedures. If one item is missing, the average score of the other scale items may be substituted prior to normalization. Multiple omissions require a case by case examination.

Factor analyses have shown that the 9 original AIMS scales could be combined into 3 or 5 component models of health status. The 3 component model groups the AIMS measures into general categories of Physical Function, Psychological Status, and Pain, while the 5 component model combines the AIMS scales into measures of Lower Extremity Function, Upper Extremity Function, Affect, Symptom, and Social Interaction (Arthritis Rheum 31: 714-720, 1988). Table 2 shows how the 12 AIMS2 scales may be grouped and scored to generate 3 and 5 component models of health status.

The attribution question in AIMS2 (item 59) allows AIMS scales scores to be modified as shown in Table 3. Responses to the AIMS2 comorbidity question (item 70) can also be used as a guideline as to whether or not to modify the AIMS2 scale scores by the formula shown in Table 3. A note at the bottom of Table 3 explains how comorbidity can be helpful in determining whether to modify the AIMS2 scale scores.

Interpretation

We have previously documented that AIMS is sensitive to clinical improvement in patients with rheumatoid arthritis and osteoarthritis, in groups treated with gold and NSAIDs, and in both short term (4-8 weeks) and longer term (26 weeks) studies (Arthritis Rheum 32: 844-850, 1989; Arthritis Rheum 27: 1344-1352, 1984). It is important however to point out that there are no established criteria for determining improvement using the AIMS approach. Each user should select in advance the scales which are most appropriate to his or her program and determine the percentage or amount of change within those scales which will be used as criteria for improvement in patient health status. For example, a program in physical therapy might focus on changes in Mobility, Walking and Bending, Hand and Finger Function, Arm Function, and Self-care tasks. It could then be determined in advance, for example, that four out of five scales should improve by 30% in order to indicate significant improvement.

A statistically significant change may or may not have clinical relevance. One approach to assessing improvement or worsening of AIMS2 scores is to present study results in terms of effect sizes. With effect size analysis, the AIMS2 score difference between pre and post-intervention measures in one group or between the scores of two groups being compared is divided by the pooled baseline standard deviation of the AIMS measure under study. (For use of effect sizes with AIMS see Medical Care 27: 178-189, 1989).

Support Services

The Research and Evaluation Support Core Unit (RESCU) at the Boston University Arthritis Center has developed this instrument and stands ready to assist users with application strategies and data processing. The AIMS instrument is copyrighted. Any investigator who wishes to use AIMS must obtain written permission. We can provide SAS code on floppy disk or hard copy for reading and processing the data on personal computers with PCSAS or uploading to mainframe computers. If you have questions about the instrument about scoring it, contact Robert Meenan at rmeenan@bu.edu or call him at (617) 638-4644.

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Table 1

AIMS2 SCALE CONTENTS AND SCORING

SCALE	ITEMS	RECODE	RAW SCORE RANGE	NORMALIZATION
MOBILITY	1,2,3 4,5	NONE (1=5) (2=4) (4=2) (5=1)	5-25	(S*-5) X .5
WALKING AND BENDING	6-10	(1=5) (2=4) (4=2) (5=1)	5-25	(S-5) X .5
HAND AND FINGER	11-15	NONE	5-25	(S-5) X .5
ARM FUNCTION	16-20	NONE	5-25	(S-5) X .5
SELF-CARE	21-24	(1=5) (2=4) (4=2) (5=1)	4-20	(S-4) X .625
HOUSEHOLD TASKS	25-28	NONE	4-20	(S-4) X .625
SOCIAL ACTIVITY	29-33	NONE	5-25	(S-5) X .5
SUPPORT FROM FAMILY	34-37	NONE	4-20	(S-4) X .625
ARTHRITIS PAIN	38-42	(1=5) (2=4) (4=2) (5=1)	5-25	(S-5) X .5
WORK	43 44-47	NONE (1=5) (2=4) (4=2) (5=1)	Categorical 4-20	Not Applicable (S-4) X .625
LEVEL OF TENSION	48,49 50,51,52	(1=5) (2=4) (4=2) (5=1) NONE	5-25	(S-5) X .5
MOOD	53 54-57	NONE (1=5) (2=4) (4=2) (5=1)	5-25	(S-5) X .5
SATISFACTION	58	NONE	12-60	(S-12) X .209
HEALTH PERCEPTIONS	61	NONE	1-4	(S-1) X 3.34
ARTHRITIS IMPACT	66	NONE	1-5	(S-1) X 2.5
	69	Recode		

*S = Added raw score of recoded values

Table 2

AIMS2 HEALTH STATUS COMPONENTS

THREE AND FIVE COMPONENT MODELS OF HEALTH STATUS
(using normalized AIMS2 scale scores)

FIVE COMPONENT MODEL

PHYSICAL	=	(MOBILITY LEVEL + WALKING AND BENDING + HAND AND FINGER FUNCTION + ARM FUNCTION + SELF CARE + HOUSEHOLD TASKS) ÷ 6
AFFECT	=	(LEVEL OF TENSION + MOOD) ÷ 2
SYMPTOM	=	ARTHRITIS PAIN
SOCIAL INTERACTION	=	(SOCIAL ACTIVITY + SUPPORT FROM FAMILY) ÷ 2
ROLE	=	WORK

THREE COMPONENT MODEL

A three component model of health status would use the PHYSICAL, AFFECT and SYMPTOM components identified above.

Table 3

AIMS2 ARTHRITIS ADJUSTED SCORES

AIMS2 scale scores may be modified to adjust for the fact that health status problems in a particular area of function may be due to problems other than arthritis. Adjustments may be appropriate when studying groups with a large percentage of elderly subjects or when studying subjects with high comorbidity scores (see Table 4).

If item 59 response for scale X is . . .		Then multiply AIMS2 scale score X by . . .
0, 4, 5	. . . . .	1
1, 2	. . . . .	.25
3	. . . . .	.5

Arthritis adjusted health status components (from Table 2) require that the individual scales within each component be normalized and adjusted prior to any component grouping.

Table 4

AIMS COMORBIDITY MEASURE

Comorbidities (AIMS2 item 70) may be totalled. The following guideline may then be used when considering the use of arthritis adjusted scores:

Use arthritis adjusted scores - When sample population age ≤ 60 and comorbidity totals ≥ 2

or

When sample population age > 60 and comorbidity totals > 2