

**The Effect on Behavioral Change with Respects to Physical Activity in Participants with  
Rheumatoid Arthritis through a Water-Based Exercise Program**

by

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## Abstract

Rheumatoid Arthritis (RA) is a serious deterioration of the cartilage that covers the joints in the bones, which are important during any kind of movement. The causes are not clear although a genetic disposition is considered the number one catalyst for the disease. Puerto Ricans reported the highest age-adjusted prevalence of arthritis with 21.8 % (American College of Rheumatology, 2013). Although there is no cure for RA, physical activity is considered the most effective way to treat these limitations. The purpose of this study was to investigate the effects on change in behavior with respect to physical activity in participants with RA, through a water-based exercise program. The following is the research hypothesis: There will be a positive change in behavior with respect to physical activity in participants with RA, after having participated in a water-based exercise program.

The research questions addressed in the study are: 1) How RA related pain and stiffness in the joints during common daily activities affect the participants' change in behavior with respect to physical activities?; 2) Are there changes in the amount of pain that RA participants normally experience after engaging in a water-based exercise program; and if so, how is the change in pain affecting participant? 3) After participating in water-based exercise program will RA participant want to continue exercising? If so, what type of exercises? The study's results presented positive change in RA participant's behavior towards physical activity, even when RA pain increased. Participants engaged in physical activity out of the water but only because it was the most attainable thing for them to do. After the water-based exercises the participants were able to do activities that they were unable to do before due to limitations.

*Keywords:* water-based exercises, Rheumatoid Arthritis, behavioral change

## Resumen

La Artritis Reumatoide (AR) es una condición de deterioración del cartílago que cubre las articulaciones de los huesos, que son importantes durante todo tipo de movimiento. Las causas de esta condición no están claras, aunque se cree que la predisposición genética es el catalizador principal. Según el “American College of Rheumatology” (2013), los puertorriqueños presentan la mayor incidencia por edad de artritis con un 21.8%. Aunque no existe cura para la AR, actividad física es considerada la forma más efectiva de tratar las limitaciones en especial la hidroterapia. El propósito de este estudio fue investigar los efectos en cambio de comportamiento hacia la actividad física en participantes con AR a través de un programa de ejercicio acuático. La siguiente hipótesis de investigación fue formulada: habrá un cambio positivo en el comportamiento hacia la actividad física en participantes con AR, después de participar en un programa de ejercicio acuático. Las siguientes preguntas de investigación fueron formuladas: 1) ¿Cómo las actividades comunes son afectadas por el dolor y la rigidez en las articulaciones causado por AR?; 2) ¿Existe algún cambio en la cantidad de dolor causado por AR que el participante normalmente experimente después de hacer los ejercicios en el agua?; 3) ¿El participante deseará continuar ejercitándose después de participar en los ejercicios en el agua? ¿Qué tipo de ejercicios o actividad física desearán realizar? Los resultados del estudio presentan un efecto positivo en el cambio del comportamiento hacía la actividad física de los participantes con AR, incluso cuando el dolor de AR aumentaba. Los participantes querían continuar con ejercicios dentro del agua, pero se les hacía difícil tener acceso a una piscina. Después de hacer los ejercicios en el agua los participantes podían hacer actividades físicas que antes eran limitadas por el dolor y la rigidez causado por AR.

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## **Chapter One**

### **Introduction**

The Center for Disease Control defines the condition of Rheumatoid Arthritis (RA) as one of the causes of premature mortality and a low level quality of life more than any other arthritis conditions (CDC, 2012). Puerto Ricans reported the highest age-adjusted prevalence of arthritis with 21.8 % (American College of Rheumatology, 2013). Genes may be one factor in the cause of this condition. However, having a family member with rheumatoid arthritis does not necessarily mean that the condition will be inherited (Nursing Times, 2009). Rheumatoid arthritis is known for its destructive erosion of the bones and loss of joint density, frequently leading to disabilities (Iversen, Chhabriya, & Shadick, 2011). Rheumatoid arthritis is a major cause of other complications such as: a) cardiovascular diseases (CVD) b) infections c) mental health conditions and d) cancer (CDC, 2007).

Rheumatoid arthritis is known as an inflammatory disease that affects more than one joint of the body, its effects are lining and causes deformities (CDC, 2007). It is expected by the year 2030 the number of people over age 65 with arthritis will surpass 41 million (Rooney, 2004). Rheumatoid arthritis is common in 0.5- 1.0% of the adult population in the world (Firestein, 2003). People with RA are eight times more likely to have functional disabilities compared to the general population. Also within the first three years 20% to 30% of the patients with RA have permanent work disabilities. This is why RA is a cause of great interference with quality of life if not treated on time (Iversen, Chhabriya & Shadick, 2011).

Early care for this disease is not only beneficial for the person's health but will also save them money on medical costs. According to the CDC (2007) in 1997 RA was responsible for more than 20% of all deaths from arthritis and in 2005 about 1.5 million adults (18 and older)

suffered from this disease. Rheumatoid arthritis is more common in people of an older age but it can start at any age (CDC, 2007). Moreover, the CDC has showed prevalence in RA in women, ages' 65- 74. Since 1996 to 2005 there has been an increase in prevalence in women and a decrease in men with RA (CDC, 2007). That is a significant amount of people that not only suffer from RA but also are more prone to other diseases. The rate of women diagnosed with RA has had increases of 2.5% each year (CDC, 2007). The cause of RA is not clear but it is believed to be a result of a defective immune response (CDC, 2007).

The CDC (2007), reported that people with RA are 40% more likely to present poor general health, and 30% report needing help with personal care and activity limitations. Limitations with personal care or mobility can be a common base for problems at work. In 1996 RA was the nineteenth most common cause for time lost at work for disability (CDC, 2007). If early diagnosis and appropriate treatment are not undertaken, RA can cause a difference with an individual's quality of life (Iversen, Chhabriya, & Shadick, 2011). For people with RA conditions it is recommended they participate in physical activity to maintain or gain back optimal health, except when the patient is experiencing severe or sharp joint pain (Koehn, Palmer & Esdaile, 2002). A major development in the past 10 years was the recognition that moderate levels of physical activity provide important health benefits (Welk, 2002).

### **Center for Disease Control Arthritis and Physical Activity Program**

Disabilities associated with RA can be treated with early diagnosis, appropriate medication and/or an organized exercise program and diet (Vradenburg, Simoes, Jackson-Thompson, & Muray, 2002). Although physical activity is not easy for arthritis patients to perform, the CDC Arthritis Program is currently promoting three helpful ways to reach an improved quality of life; A self-management program, a physical activity program and a

communications campaign promoting physical activity (CDC, 2007). The CDC's Physical Activity Program is focused on promoting a healthier more active lifestyle and exercising to increase quality of life and reduce pain. Healthy adults age 18 to 65 should participate in moderate- intensity aerobic physical activity for at least 30 minutes, five days a week or vigorous intensity aerobic physical activity for 20 minutes three days a week (Haskell, Lee, Pate, Powell, Blair, Franklin, Macera, Heath, Thompson & Bauman, 2007). The initiative of this program is to educate people about RA and how to cope with it, demonstrating that this disease can be managed and it does not have to affect the quality of life. The program mentioned above includes the Arthritis Foundation Aquatic Program (AFAP). The AFAP is a warm-water exercise program that has been shown to reduce pain and improve overall health. The Arthritis Foundation offers two ways to partake from this program: 1) a six week one hour class led by a certified instructor, and 2) a 45 minute DVD workout that can be used outside the class room environment (Arthritis Foundation, 2011). The three programs mentioned above focus on RA knowledge for every person who suffers from the disease.

Knowledge of RA and its symptoms are essential for the AFAP; informing the persons of their own disease and all the complications it can bring to their life (Jones & Bartlett, 2014). Not all RA patients are aware of the benefits that exercising has on their condition. Exercise in a body of water takes most of the impact out of the movements. Most RA patients do not exercise or participate in physical activity because of the pain that those movements produce on their joints. Most of the pain produced by the exercises is reduced by the flotation of the person in the water. Rheumatoid Arthritis is a very serious disease as it is the leading cause for disabilities in the United States (CDC, 2007). People with RA are more likely to have functional disabilities (CDC, 2007).

**Purpose of Study**

The purpose of this study was to investigate the effects in change in behavior in respect to physical activity in participants with RA, through water-based exercise. The study introduces the participants with RA to physical activity through a water-based exercise program.

**Limitations**

The following limitations apply to this study:

1. Participants have Rheumatoid Arthritis condition (convenience sample) sampling focused on the researcher's judgment. Non- probability based sampling.
2. Water temperature
3. Mortality
  - a. Participant can decide to stop taking part in the study for any reason and at any time.

**Assumptions**

Assumptions for accomplishing this study:

1. Participant will continue to use the medication given by their doctor if any.
2. The participant will attend to all routine doctor visits.
3. The participants will answer the surveys with total honesty.
4. Previous participation with water-based or any PA can affect the participant's experience.

**Research Hypothesis**

Hypothesis of the study:

There will be a positive change in behavior in respects to physical activity in participants with RA, after having participated in a water-based exercise program.

There will be a negative or no change in behavior in respects to physical activity in participants with RA, having taken part in the water-based exercise program.

### **Research Questions**

1. How RA related pain and stiffness in the joints during common daily activities affect the participant's behavior in respects to physical activities?
2. Is there a change in the amount of pain that RA participants normally experience after participating in a water-based exercise program? How is the change in pain affecting behavioral change in respects to physical activity?
3. After taking part of water-based exercise program will RA participant want to continue exercising? If so, what type of exercises?

### **Definition of Terms**

Water-Based Physical Activity: any bodily movement, produced by the skeletal muscles that produce caloric expenditure executed in any body of water (Welk, 2002).

Physical Activity: any bodily movement produced by the skeletal muscles that produce caloric expenditure (Welk, 2002).

Exercise: any type of physical activity that is planned, structured and repetitive and is a subset of physical activity and may constitute all or part of each category of daily activities except sleep (Caspersen, Powell & Christenson, 1985; Welk, 2002).

Rheumatoid Arthritis: a systematic disease causing widespread inflammation of the synovial tissue, linin, joints and erosion of the bones (Rooney, 2004; CDC, 2007).

Synovial tissue: soft tissue found between the joint capsule and the cavity of the synovial joints. It surrounds the joints and is the tissue attacked by the body's immune system (CDC, 2007).

Synovial joints: the most movable joints in the body (CDC, 2007).

Pannus: an abnormal layer of fibrovascular tissue (CDC, 2007).

Buoyancy: upward force on an object that is submersed in water, giving the feel of weightlessness, ability of an object to float in water or air (Merriam-webster.com).

Synovial lining- the lining of the joints, normally only one or two cell layers thick, that is responsible for the production of the joint fluid. Also known as synovium (CDC, 2007).

Range of Motion (ROM)- exercises are movements in each possible direction for the joint affected with the disease (Koehn, Palmer & Esdaile, 2002).



## **Chapter 2**

### **Review of Literature**

#### **Rheumatoid Arthritis disease and its complications**

The purpose of this study was to investigate the effects on behavioral change with respects to physical activity in participants with RA, through water-based exercise. Rheumatoid Arthritis is the leading cause for disabilities in the United States (Vradenburg, Simoes, Jackson-Thompson & Muray, 2002). Rheumatoid Arthritis is a chronic, inflammatory, progressive and systemic disease (Madsen, 2011). Rheumatoid Arthritis is a type of arthritis that affects five or more joints in the body. It is also considered to be an inflammatory disease that affects the joints and can affect organs as well (CDC, 2007). Rheumatoid Arthritis pain is complex, as Kianifard & Chopra (2016) mentioned in their study. Rheumatoid Arthritis is defined as follow: A systematic disease causing widespread inflammation of synovial tissue lining joints (Rooney, 2004). Rheumatoid Arthritis is a common deterioration of the articular cartilage that covers the ends of the bones in the joint, which is used as shock absorbers during any type of movement (Rooney, 2004). According to Rooney (2004) some specialists believe a genetic predisposition is the catalyst, while others believe bacteria or viruses may trigger it. When this happens it affects the lining of the joints causing erosion and damage to the bones and cartilage (CDC, 2007). Pain becomes the most common reason for participants with Rheumatoid Arthritis to seek out medical care (Anderson, 2001). In addition to the inflammation, the pannus (the front of the tissue) invades and destroys local articular tissues (Firestein, 2003). This disease is known to affect the synovial membrane which is a fluid situated between the most movable joints in the body (CDC, 2007). The most common known causes for this disease are genetic abnormalities and factors such as viruses and other bacteria that cause the immune system to attack joint tissue (Rooney,

2004). Studies suggest that around 60% of heritability is due to genetic factors (Madsen, 2011). Rheumatoid Arthritis is a deterioration kind of disease whose symptoms get progressively worst at an older age. Although it is more commonly linked to old age, RA is a disease that is most common after the age of 40, but it can affect people of any age (Nursing Times, 2009). Anderson (2001) found that 66% of RA patients classified pain as the most important symptom to be treated. One of the most marked features of RA is what Bland (1968) calls morning stiffness, which in severe cases can last throughout the day (Bland, 1968). Early detection of the disease is ideal in order to slow the diseases progress. There is evidence that RA is typically two to three times higher in women than men, this potential risk factor is due to hormones related to reproduction (CDC, 2007).

### **Physical Activity**

Welk (2002), defines physical activity as any bodily movement produced by the skeletal muscles that produces caloric expenditure. Not to be confused with exercise which is defined as any physical activity, which is planned, structured and repetitive (Welk, 2002). Physical activity has five principles of training which are specificity, moderation, reversibility, overload and progression. Physical activity is most common characteristics are: intensity, type, frequency, and duration (Welk, 2002). Physical activity is ruled by the principles presented in frequency, intensity, time, and type or specificity (F.I.T.T). The principles of F.I.T.T. are guided by progression and overloading more than any of the other principles of training. These principles describe how to safely apply the principles of overload and progression (AAHPERD, 1999). Keefe, Brown, Wallston & Caldwell suggest that RA patients tend to exaggerate their pain as a type of strategy.

### **Frequency, Intensity, Time, and Type**

Frequency is how often a person performs the physical activity. A moderate frequency for physical activity is three to five times a week, leaving at least two days of rest (AAHPERD, 1999). Intensity is how hard the periods of physical activity are during a person's exercise. There are different ways in which intensity can be measured, but one of the most common is by utilizing a heart rate monitor during a person's participation of physical activity (AAHPERD, 1999). Time is the amount of time engaging in physical activity. As explained by American Alliance of Health Physical Education Recreation and Dance (AAHPERD) (now Shape America) the principle of time varies with the health related fitness component. Normally stretching and warm up takes 10 – 30 seconds, while aerobic activity must be at least of 20 minutes (AAHPERD, 1999). Type refers to the specific physical activity chosen to be a part of the exercise program. The type of physical activity will be determined by the person's goal or their health conditions (AAHPERD, 1999).

### **Limitations and Rheumatoid Arthritis**

As defined by Welk (2002), physical activity is any body movement produced by the musculoskeletal system that results in caloric expenditure. This includes any form of movement that contributes to any level of caloric expenditure. Moderate physical activity is now recognized as enough to result in significant improvements in health and disease prevention (Welk, 2002). Physical activity can help alleviate the pain and avoid overuse of strong medications (Bland, 1968). Bland (1968) explains that cautious exercise is a very helpful treatment for joint mobility problems whether due to pain, spasm, weakness or stiffness. Early diagnosis and treatment relieves pain, reduces inflammations, and helps limit joint damage (Rooney, 2004). Pain from RA can also be related to side effects of the many medications used in treatment (Anderson,

2001). According to Rooney (2004) irreversible damage takes place within the first two years. Rooney also mentions how the goal of the treatment is to control inflammation, prevent joint damage, and relieve pain. Moreover, according to Rooney this treatment has two stages; when in pain, patients should rest, but when the disease is under control, patients should exercise to strengthen muscles and maintain range of motion. Patients need to learn how to balance resting time with exercise. Non-pharmacological care like physical activity will help the patient with RA cope with the chronic pain and disabilities or physical limitations through the design of programs that work on flexibility, endurance, strength, bone integrity, coordination, balance and risk of falls (Iversen, Chhabriya & Shadick, 2011).

### **Physical limitations**

Prevalence of physical limitations due to joint symptoms increases with age, though RA is not associated with middle age. Arthritis was associated with the presence of a functional limitation either with or without the need for aid with personal care needs (Vradenburg, 2002). The condition is also associated with average and below average perceived general health status and with higher number of days of poor physical health (Vradenburg, 2002, p. 102). As Vradenburg (2002) mentions this association between arthritis and physical limitations demonstrate the connection between arthritis and disability. Disabilities associated with arthritis can be made less hurtful by early medical care, appropriate treatment, and weight control. A study by Park & Chang (2016) investigates rehabilitation for pain relief in patients with RA, and it showed that physical therapy and occupational therapy can reduce pain in RA patients. Physical Activity is the most effective treatment for physical limitations especially utilizing range of motion exercises. Range of motion is the amount of movement you have at each joint. Ranges of motion (ROM) exercises consist of each possible movement of the joints, which is

very effective for diseased joints. Range of Motion (ROM) physical activity can be beneficial in three important aspects: maintaining or increasing joint flexibility, reducing stiffness and pain helping the patient perform daily activities (Koehn, Palmer & Esdaile, 2002). Self-help courses and exercise may increase mobility and quality of life for people with activity limitations, while at the same time decreases health cost (Vradenburg, Simoes, Jackson- Thompson, Murayi, 2002). These limitations can be overcome by low impact exercises. Less impact physical activity can be attained through water-based physical activity. Studies show individuals attending water-based exercises experience less pain, improved joint function, an increase in muscle strength, and a better quality of life and wellbeing (Arthritis Foundation, 2014).

### **Rheumatoid Arthritis & Water-based Physical Activity**

Rheumatoid Arthritis is an autoimmune disease that results in inflammation of tissues and joints. Other studies suggest that around 60% of heritability is due to genetic factors (Madsen, 2011). The first symptoms and signs usually appear in the joints (Koehn, Palmer & Esdaile, 2002). The membrane or lining, called synovium, is normally thin when healthy. When RA affects the area it produces inflammation of the synovium, which is called Synovitis (Koehn, Palmer & Esdaile, 2002). This inflammation can bring pain and discomfort to the person. Without adequate treatment the disease can be the cause of loss of some functionality or mobility. Importantly, results indicate that disease activity was not exacerbated by the land-based exercises. It is however worthwhile noting that there were more clinically significant decreases in the joint counts for the subjects following water-based therapy than land-based therapy (Nolte, Rensburg & Krüger, 2011). For people with the RA condition it is recommended to participate in physical activity to maintain, or gain back optimal health, except when the patient is experiencing severe or sharp joint pain (Koehn, Palmer & Esdaile, 2002). Besides threatening a

person's mobility and basic functionality, RA is commonly related to complications with cardiovascular diseases, cancer and death (Koehn, Palmer & Esdaile, 2002). Most treatments for RA patients consist of medication and trying to get physically active. Most people with RA cannot perform normal physical activities due to pain and bodily movement limitations. With swollen joints and fatigue, which often accompanies the disease, RA makes it a real struggle for people to perform or maintain physical activity (Koehn, Palmer & Esdaile, 2002). As these authors continue to explain how RA is a disease that will make it difficult for the diagnosed person to exercise, water-based exercise offers the participants a safe, low impact way to participate in physical activities.

The use of water as a means of treatment is very old in the history of humanity (Escalante, Saavedra, Garcia- Hermoso, Silva & Barbosa, 2010). Water provides buoyancy that helps support the joints, making it easier to move around freely (Arthritis Today, 2013). Besides offering support to the joints, water makes a unique resistance for muscles, making them stronger and healthier. The potential benefits of hydrotherapy for patients with RA are to improve and/or maintain functional ability and quality of life (Al-Qubaeissy, Fatoye, Goodwin & Yohannes, 2013). Anyone can participate from water exercise by simply walking in waist or neck deep water level. A webbed glove, foam barbells, sponges, and kickboards are the most commonly used tools in water exercises. Water-based exercises are a good low impact physical activity for the bones, muscles, and joints (Arthritis Today, 2013). Hydrotherapy has been shown to increase muscle strength, increase joint range of motion, improve aerobic capacity, reduce pain and improve function (Nolte, Rensburg & Krüger, 2011). Aquatic immersion is an ideal environment to mimic weightlessness. This feeling of weightlessness is explained by the Archimedean Principle that English, Greek and Roman physicians have been prescribing what they called

healing warm baths also referred to as hydrotherapy for centuries (Lepore, Gayle, Stevens, 2007). As Lepore and her colleagues state, water-based exercises have been a very important element in RA treatment, thanks to its low impact physical activity. There has been no recent exclusive systematic review to examine the efficacy of hydrotherapy for patients with RA (Al-Qubaeissy, Fatoye, Goodwin & Yohannes, 2013).

### **Applied Behavior Analysis Related to the Prediction of Physical Activity and Health Behavior.**

Behavioral analysis studies are flooded with many different behavior theories. The behavior analyst is interested in understanding human behavior in the sense that we know what the demonstrated cause and effect relationships are between some environmental event and the resulting behavior (Bailey & Burch, 2002). Bailey and Burch (2002) continue to explain that the goal of these designs is to demonstrate the cause and effect relationship between an event and a target behavior. The need for research designs by which to understand the behavior of single subjects has been largely met by the adaptation of existing designs to applied problems. Behavior assessments involves a variety of methods including direct observations, interviews, checklists, and tests to identifying behaviors to change (Cooper, Heron, Heward, 2007). The four major methods for obtaining assessments information are a) interviews, b) checklists, c) tests, d) direct observation (Cooper, Heron, Heward, 2007).

### **Theory of Planned Behavior (TPB)**

The Theory of Planned Behavior (TPB) began as the Theory of Reason Action in 1980, with the intention of predicting a participant's intention to engage a behavior at a certain time or place (Jones & Bartlett, 2009). Behavioral changes in the Theory of Planned Behavior (TPB) depend on both intention and behavioral control. In TPB the people's beliefs are what will decide

behavioral change. This theory has three types of beliefs: behavioral, normative, and control. This theory states that intentions are influenced by the attitude of the likelihood that the behavior will have the expected outcome (Jones & Bartlett, 2009). In physical activity this theory uses all three types of beliefs to try and predict if a person will continue to participate in PA, and/ or have a change in behavior in respects to exercising.

### **The Precaution Adoption Process Model (PAPM)**

This model tries to explain how a person comes to a decision to engage in physical activity and how they turn that decision into action. Irving Janis and Leon Mann (1977) were the first to use the PAPM. They used this theory to explain how people responded and how they coped with threats (Weinstein, Sandman & Blalock, 2008). According to Weinstein (2008) PAPM is the adoption of a new precaution or cessation of a risky behavior. Precaution Adoption Process Model does not apply to gradual development of repetitive behavior, such as exercise (Weinstein, 2008). Unless it is the adoption of a new exercise routine or diet that is being started for health-related issues. Precaution Adoption Model is not applicable in situations where health considerations play a small role. The commencement of risky behaviors is also not applicable to PAPM. This theory is not applicable unless the behavior of exercising is a preventive one. Health considerations have to play a role in order for this model to apply. It also does not apply or explain the commencement of health-related risk behaviors (Weinstein, Sandman & Blalock, 2008).

### **Transtheoretical Model of Behavior (TTM)**

The Transtheoretical Model of behavior focuses on decision-making abilities rather than focusing on the influences on behavior. In the Theoretical Model individuals go through five



stages of change: the first step is precontemplation the stage where people do not intend to take action. In this stage individuals are normally unaware of the negative consequences of not engaging in the new behavior. The second stage is known as contemplation the stage where people intend to adopt a healthier behavior in the near future. They start to realize that not taking action will produce negative consequences. Third stage is preparation the stage in which people are ready to take action within the next 30 days. The fourth stage is the action the stage where people have started a healthy behavioral change and are looking to continue it. The maintenance-stage is when a person has sustained their behavioral change. It is important to note that not all persons though these stages in order.

### **Health Belief Theory**

The models were not used in the study as they limited the behavior analysis to certain orders, or certain stages that not all people go through. Two theoretical models were used in this investigation to help explain the participants' physical activity and health behavior. The first is the Health Belief Theory, which was first developed in the 1950's by Rosenstock and Kegels. It was developed as a way to explain why medical screening programs offered by the U.S. Public Health Service were not very successful (Jones & Bartlett, 2009). The basis of this theory states that a person may take positive action on their health. They will do so if they feel that the negative result of not exercising can be avoided and if the participant is able to successfully perform the recommended action. The concept of the Health Belief Theory is that health behavior is determined or can change by a person's own beliefs or perceptions of a disease and the strategies available to decrease its effects (Jones & Bartlett, 2009). As explained by the authors Jones and Bartlett, the main constructs for the Health Belief Theory are: perceived

seriousness, perceived susceptibility, perceived benefits, and perceived barriers. Each one separately or together can be used to describe what Health Belief Theory is all about (Jones & Bartlett, 2009).

### **Perceived Seriousness**

It refers to what a person knows and what they belief regarding the severity of the disease they are diagnosed. The people's knowledge is often based on medical information, but it may also come from the beliefs a person has about the difficulties the disease can bring to their life in general (Jones & Bartlett, 2009). An example given by the authors to understanding the perceived seriousness is the flu. Most people see the flu as a minor inconvenient that can be treated with staying a few days at home and resting, while for someone diagnosed with asthma, contracting the flu may send them to the hospital (Jones & Bartlett, 2009).

### **Perceived Susceptibility**

Personal risk of contracting a disease is one of the most powerful perceptions in promoting people to adopt a healthier behavior (Jones & Bartlett, 2009). The higher a person's risk of contracting a disease, the likelihood of adopting a healthier lifestyle is higher. Jones and Bartlett (2009) also mention how this works the other way around; if the person does not feel the risk of contracting a disease they are less likely to adopt a healthier behavior. An example given by the authors is how older adults do not consider themselves at risk for HIV infection so they do not practice safe sex. While perceived susceptibility by its own is enough to make a person change their behavior, its effects are even greater when it is combined with perception, resulting in perceived threat (Jones & Bartlett, 2009).

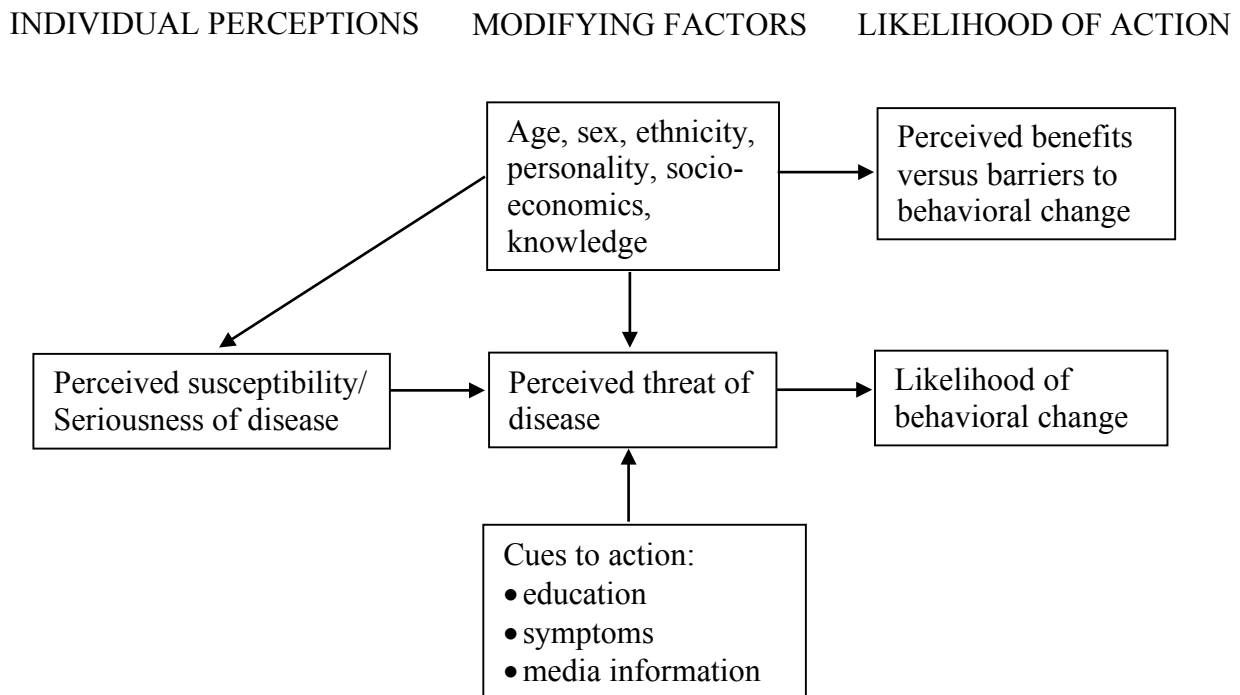
### **Perceived Benefits**

Perceived benefits are defined as a person's opinion of the value and usefulness of a new behavior that will decrease the risk of developing or aggravate a disease (Jones & Bartlett, 2009). An example of perceived benefits having an effect on changing a person's behavior is how the cure rate of cancer if detected early is about 90% (Jones & Bartlett, 2009).

### Perceived Barriers

Figure 2.1

#### *Health Belief Theory Model*



*Figure 2.1* The Health Belief is presented in three columns to show the relationship between the perceptions, their modifying factors and their result. (Stretcher & Rosenstock, 1997; Glanz, 2002)

A change in behavior is not something that comes easily to most people. To change, a person needs to evaluate the obstacles in the way of him or her adopting a new behavior (Jones & Bartlett, 2009). As described by the authors some of the obstacles include difficulty in starting a new behavior like exercising, developing a new habit and the fear of not being able to perform a certain action.

A person's perceived susceptibility will be modified or affected by certain factors each specific to that person. Some of those factors or elements are person's age, personality, ethnicity, socio-economic status and knowledge about their condition if any. By modifying their perceived susceptibility it may change how they perceive the threat caused by that disease. These elements will modify and mold their personal perceived threat of the disease, which at the same time are affected by that person's unique education, or knowledge of their disease, symptoms and progress of the disease. All of these elements become a part of a person's decision or likelihood of adopting a new behavior. Before the person decides to adopt or not a new behavior it faces another obstacle and that is the barriers to behavior change against the perceived benefits of adopting a new behavior. An example in the area of physical activity for a person's perceived barriers is their belief in their ability to actually do the exercises.

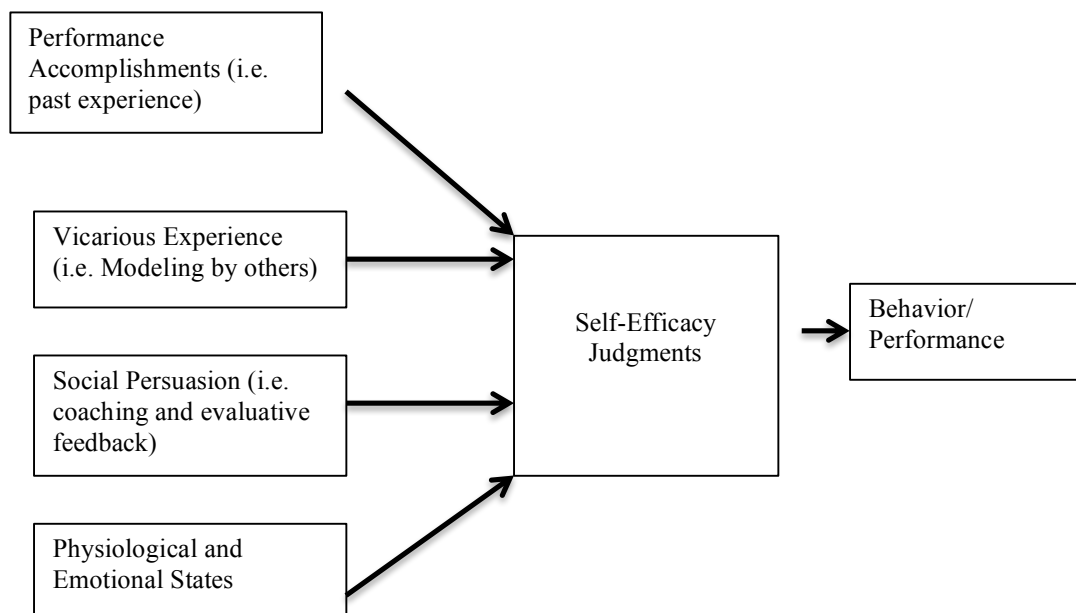
### **Self- efficacy Theory**

The Health Belief Theory has been expanded by many other factors and theories including the self-efficacy model. (Jones & Bartlett, 2009) Albert Bandura originated the self-efficacy theory in 1963 (Jones & Bartlett, 2009). Self- efficacy is a social cognitive approach to behavioral change in which behavioral, physiological, and cognitive factors interact with each other. Self- efficacy is a theory that was created out of Albert Bandura's social cognitive theory (McAuley & Blissmer, 2000). Following a study by Stephens, Lehman, Raheja, Yang, Walsh, & Simmons (2016) Self- efficacy appears to mitigate pain. There is an increasing awareness that rheumatoid arthritis symptoms are influenced by psychosocial factors such as self- efficacy, which could be defined as one's abilities to carry out a task with a desired outcome. There is an increase in awareness that rheumatoid arthritis symptoms are influenced by psychosocial factors

such as Self-Efficacy, the belief in one's ability to carry out a task (Primdahl, Wagner & Horslev- Petersen, 2011).

The Self-Efficacy Theory focuses on the ability a person has to achieve a certain goal. This is where a person's self- esteem, their own perception of them, motivations, and frustration come into effect. Jones and Bartlett (2009) describe self- efficacy as the belief of one's own ability to do something giving the simplest definition of the self- efficacy theory. Generally people do not try to do something new unless they think they can do it (Jones & Bartlett, 2009). Self- efficacy plays a more prominent role in the prediction of exercise behavior in the early adoption and adaptation stages of the programs, but less in the maintenance portion (McAuley & Blissmer, 2000).

Figure 2.2 Self-Efficacy Model



*Figure 2.2* This model represents the four elements of the Self- Efficacy theory, which have an effect on judgments and behavioral change.

Self-efficacy theory explains the participant's own ability or prediction of their ability to succeed on starting something new. This gives support to the belief that the self-efficacy theory is very helpful at the beginning of an exercise program, as the participants own belief will decide if they will attempt this new activity or not, but it will not have an effect on maintaining that activity. The judgments that a person will have in order to make a decision on whether or not to adopt a new behavior will be affected by certain factors: some social, others environmental, behavioral and cognitive. These elements will be their past experience of adopting a new behavior, their experience in life with the process of adopting a new behavior (it can be an experience with someone they know), how persuaded they are by the people in their environment and by their own psychological state. All these elements come together to create a person's judgment on adopting a new behavior and continuing on their own.

In the self-efficacy theory a person will look at their past attempts of completing an exercise, how other people have done it and who has been able to accomplish said task, the persuasion of someone else, and their emotional state on the matter. With all these four different variables the person will make a decision on whether or not, in this case, to exercise. Health belief theory has similar roots as the self-efficacy theory. The biggest difference is the fact that the theory expects the person to want to change their behavior for a healthy one because of the dangers of the disease. For this theory other topics come into play regarding the person's decision to change their behavior. Some of the factors or topics are their social-economic standing, knowledge of the disease, age, and sex.

After they participate in low impact water-based exercise their behavior toward wanting to engage in physical activity will be studied. Utilizing both theories in this study will help evaluate if the participants have a change in behavior in respects to physical activity. Both

theories can be applied to explain behavioral change toward becoming more physically active individual. The theories mention above and the interventions will work together to identify changes in participants' behavior in respects to physical activity. The following model shows how the self- efficacy components are introduced and formed part of the perceived threat of disease of the Health Belief Model.

Figure 2.3 The Self- Efficacy Model in the Health Belief Model

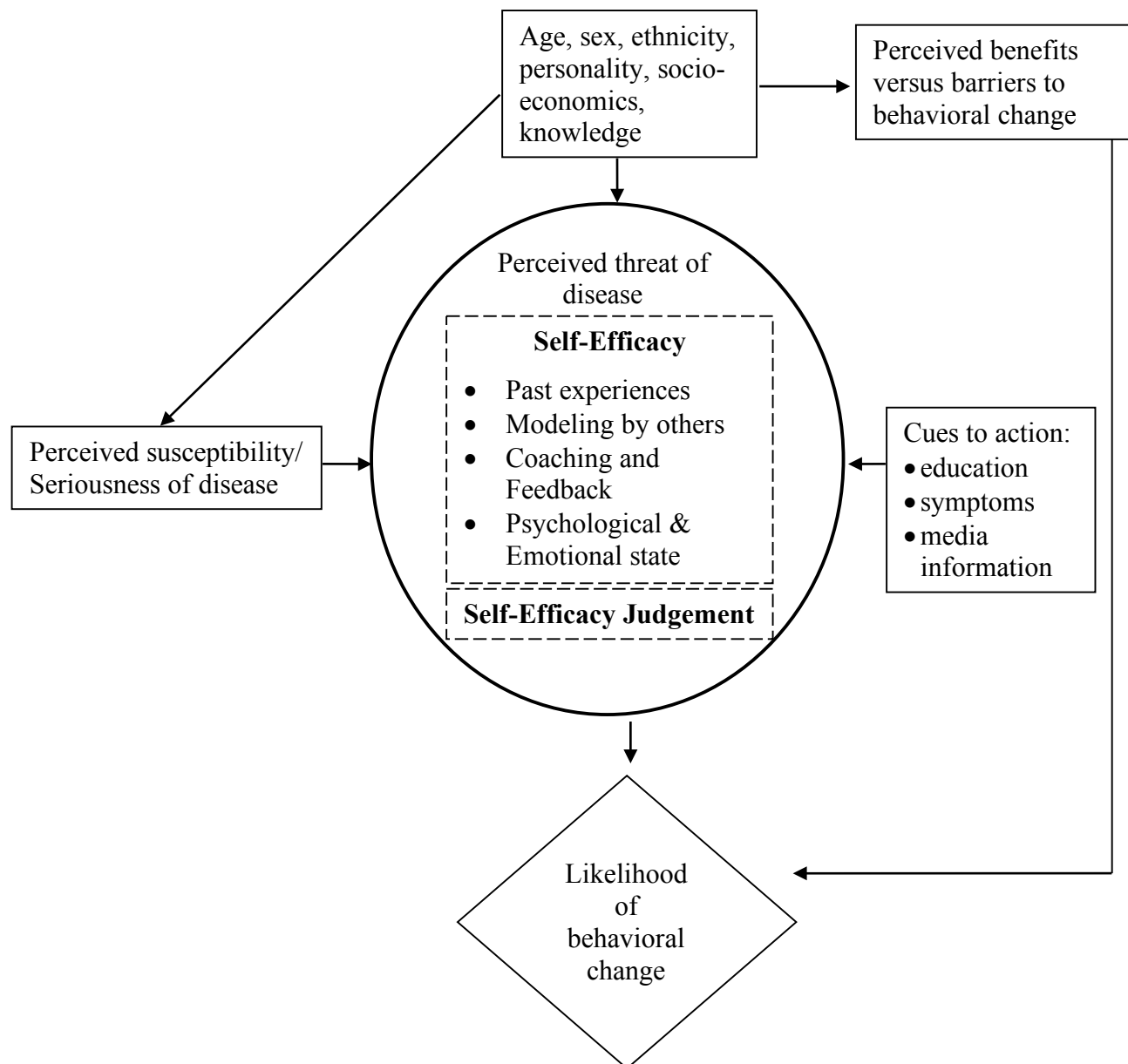


Figure 2.3 This figure presents where the integration of the Self-Efficacy theory into the Health Belief theory.

In this model the Self-Efficacy model is introduced into the Health Belief Model. The four components of the Self-Efficacy Model are present in the Health Belief component of Perceived Threat of Disease. All of the elements of the Health Believe Model will be affected before the likelihood of behavioral change by their personal judgments. These personal judgments are the ones fabricated by the person's own Self-Efficacy. What they expect and their personal experiences. With the use of these two theories and The Self-Efficacy Model in the Health Belief Model the participants behavioral change, if any, will be analyzed. All the tools for behavior analysis in this study will be verified with a pilot study. Information on methods, the pilot study and the actual study will be provided in Chapter three.



## **Chapter 3**

### **Methods**

The purpose of this study was to investigate the effects on behavioral change in respects to physical activity in participants with RA, through water-based exercise. This chapter will describe the pilot study, participants, research methods, equipment, intervention procedures, data collecting and analysis of the study. Pilot testing will be present in this study. A pilot study is an informal, loosely structured set of procedures where the researcher explores, tests and examines many of the parameters of the study being planned (Bailey & Burch, 2002). This study has the approval from the Protection of Human beings in Research Committee (CPSHI) in 2014 (see Appendix A)

#### **Participants**

Four participants with RA were selected to participate in the study. There were three female and one male participants. Their ages ranged from 40 to 68 years old. The participants were selected through a convenient sampling process. The convenient sampling was done in order to obtain the participants with the needed characteristics. The purpose of the study was explained to them and what their participation consisted of and of the options they had to stop participating. They signed a letter of informed consent in order to participate in the study (see appendix).

#### **Research Methods**

There are several experimental designs being used for behavior analysis research, to demonstrate the relationship between a behavior and an intervention (Bailey & Burch, 2002). There are five research designs that are functional with experimental research on behavioral

change. The five designs are the following: reversal design, multiple- baseline design, multi-element baseline designs, changing-criterion design, and group design.

### **ABAB Reversal Design**

The Applied Behavioral Model that was used is the reversal or withdrawal design. One of the primary advantages of the reversal design is its ability to provide a clear existing relation between the independent variable and the dependent variable (Cooper, Heron & Heward, 2007). This design was a useful tool in presenting evidence of the treatment causing a behavioral change in the participant. This model demonstrated directly how interventions affect the participant's behavior by constantly turning on and off the intervention (Bailey and Burch, 2002). A study by Martin & Epstein (1976) presented an outcome where the different designs including the ABAB are showed to produce reliable data on which conclusions can be made about the relationship between intervention and baseline. The reversal design fitted with this study as the behavior that is trying to be achieved with the interventions is reversible, and the return of the baseline behavior from the intervention is not harmful (Bailey & Burch, 2002).

Of all the applied behavioral analysis methods the ABAB reversal design is the best that fits the necessities of this study. The ABAB reversal design helps the researcher predict what happened to the participants' behavior when a tendency in the baseline and the intervention is visible. The ABAB design is an improvement of the ABA design in that the results are studied more than once, hoping to get replication of both the baseline and treatment stages (Bailey & Burch, 2002). The reversal design is composed of repeated measures of behavior in a given setting which in this study includes four consecutive phases: first baseline, first intervention, second baseline, and second intervention (Cooper, Heron, & Heward, 2007). The ABAB design is the backbone for the demonstration of experimental control in behavior analysis (Bailey &

Burch, 2002). In this experimental study the intervention or treatment was the behavioral changes when the participants engaged in water-based exercise. Through the different phases the participants filled out both surveys each day.

### **Limiting condition of the reversal design**

After many studies have been done, there are certain conditions in which ABAB design loses its persuasiveness. One of these limitations was how few data points per condition prevented the researcher from making a prediction of the next point in the data (Bailey & Burch, 2002). The authors continue to explain that this design must be applied and repeated until stability is achieved. In order for the design to show its repeated effect each condition or procedure must be reinstituted and the same effect must be seen (Cooper, Heron & Heward, 2007). The ability to replicate a condition will depend directly on the result of its second time applied compared to the first time it was applied. Another limitation that Bailey and Burch (2002) present for the reversal design is that it is not a very effective when you have more than one treatment. The reversal design is not appropriate in evaluation that cannot be withdrawn once it has been presented (Cooper, Heron & Heward, 2007). The authors explain the design's irreversibility as the inability to reproduce the same level of behavior observed in earlier phases.

### **Equipment**

The study took place at the University Natatorium pool facility. The participants went into the pool and used different types of water equipment; sponges, floating aids, and an appropriate bathing suit. The participants were asked to utilize a comfortable swimming suit. No extra clothing or equipment was needed, as they did not have to bring swimming caps. Warm water is used in many studies for treating health conditions but was not a part of this specific study. This is because of the pool not having the facilities for warm water.

In addition two Likert Scale questionnaire were used: the Attitude Towards Physical Activity Scales (ATPAS) (Lorig, Chastain, Ung, Shoor & Holman, 1989) and Rheumatoid Arthritis Pain Scales (RAPS) (Anderson, 2001) (see appendix) during all of the phases. The two questionnaires were slightly modified from their original source to meet the needs of the study, however, the design of the questionnaires was not. .

The Attitude Towards Physical Activity Scale and the RAPS were used to measure each participant's attitude in respects to exercising before, during, and after participating in the study. The ATPA scale helped measure the participants' attitudes in six dimensions of active and passive involvement in physical activity (Morrow, Jackson, Disch & Mood, 2005). The scale lists items from the attitudes in respects to physical activity in which each participant responded to each item with a range from very unsure (one), and very sure (five).

## **Procedures**

The adult without RA disease is recommended to participate in moderate to intensity physical activity at least 150 minutes a week (U. S. Surgeon General, 2010). The participants will attend to a 45 minutes, three days a week group aquatic exercise routine. The study used an IRB and procedures that were approved by the University Office of Investigations (see appendix A). The rest of the days of the week were left for the participant to choose if they wanted to exercise or not. The water-based exercise undertaken was done during three days a week including everything from full body movements to the use of a sponge, a sponge they had to squeeze in order to work on the strength and movement in their hands and wrists. The exercise they performed was done at a moderate intensity level. The participants received explanation on how the water also works as a resistance for the muscles to strengthen them.

During the days of the intervention phase the researcher took field notes of any behaviors shown by the participants before, during and after the exercise routine. These field notes were taken as the participants arrived and prepared to enter the pool and as they left after the intervention. The participants had an expert on physical activity guiding them in the water throughout the activities. The four participants received explanation on the detail of everything that they were doing during the study (all four phases, ABAB). The letter of informed consent listed all of the exercises that they had to perform. It also explained to them how their confidentiality was to be kept and that they can decide to stop participating from the research at any point. There were always several American Red Cross certified lifeguards present at every pool session. These lifeguards are professionally trained to treat and give first aid to any person inside or outside of the water in the Natatorium building. The baseline took two weeks, and it consisted of the participants filling out the surveys twice a week. Then two more weeks after intervention phase, the participants filled out a survey twice a week. For two weeks the participants had to fill out surveys about rheumatoid arthritis pain and behavioral change in respects to physical activity. The intervention took place for three weeks between the two baselines. During the intervention the participants continued to fill out the surveys twice a week but were also participating in water-based physical activity.

They were explained what kind and type of physical activity they were going to be executing. The participants were given this letter and all of the other explanation of the study individually. Also they were informed of all the precautions that were taken (for example the lifeguards and the physical activity experts in the pool). After all the explanation, they had to sign the letter of informed consent where they gave the authorization to participate in the study. The letter of consent was given to the participants the day before starting the first baseline phase

(filling out the surveys, not the physical activity phase). Each participant's survey was kept confidential. Letters (A, B, C, and D) were used to identify each person's individual surveys. They were told about all the safety precautions taken in the pool.

### **The first baseline phase (A1)**

In the baseline phase the participant was to continue to do everything they normally do in their everyday life. The only different aspect is that they were filling out the ATPA and the RAPS surveys. They filled out the surveys every day for the three weeks of the phase. The participants did not have to do anything else besides fill out the surveys in the most honest way.

### **The first intervention phase (B1)**

In the intervention phase the participants were attending to three meeting a week for water-based exercises. During the intervention phase the participants were also filling out the two surveys. They would fill out the surveys every day for the duration of the phase. The moderate intensity exercise had a duration of 45 minutes, which consists of squats, jumping-jacks, swinging the arms, squeezing a sponge, walking forwards, backwards, and sideways. These were the two behavioral indirect assessment methods used for the study. All the surveys and field note helped understand the changes if any on health behavior during, before, and after physical activity in RA participants.

### **The second base line phase (A2)**

This second baseline was exactly the same as in the first baseline phase; the participant's only activity for the study was to fill out the ATPA and the RAPS. They were to fill out the surveys every day for the duration of the phase.

### **The second intervention phase (B2)**

In this phase the participant did the same as they did in the first intervention phase. They participated in water-based exercise three times a week and filled out the ATPA and the RAPS surveys. They filled out the surveys every day for the two weeks of the phase. The researcher took notes before and after the intervention.

Data was analyzed from all three sources mention above. The data was analyzed using the field notes, and interview notes taken by the researcher, both survey scales filled out by the participants the ATPA and the RAPS, and the graphs. Means from the surveys were presented in a line graph in order to be visually analyzed.

### **Pilot Study**

A 66 year old participant with diagnosed with RA was be selected to participate in a ten-day study, which consisted of participating in a six days 45 minutes of water-based exercise. The participant had to do moderate intensity physical activity from 8:00 to 3:00pm. These physical activities consist of all sorts of physically demanding chores. These chores were working on cars, construction, woodworking and yard work. The first two days consisted of the first baseline, followed by three days of the intervention stage (water-based exercises), then another two days for the second baseline and three days for the second intervention.

The participant was given the surveys several days before the beginning of the first baseline. The participant filled out the Attitude Towards Physical Activity Scales and Rheumatoid Arthritis Pain Scales every day during the entire study. The water-based exercises took place in a pool, where the participant performed specific water-based exercises. The exercises consist of walking side ways, backwards and forwards inside the pool, moving the arms to the sides, up and down using the water as resistance, flexing of knees, touch-down exercise, using swimming aids boards, and the squeezing of sponges with hands. The exercises

are modifications from the Arthritis Water Exercise DVD from the Arthritis Foundation. These exercises are basically easier modifications of Range of Motion (ROM) exercises. Range of motion exercises are types of exercises that focuses more on a specific joint and moves it through its entire normal range of motion (Koehn, Palmer & Esdaile, 2002). The exercises that were used are modifications from the Arthritis Foundation Aquatic Program DVD. At every intervention a physical activity expert helped the participant get inside the pool. The physical activity expert guided the participant during all the exercises.

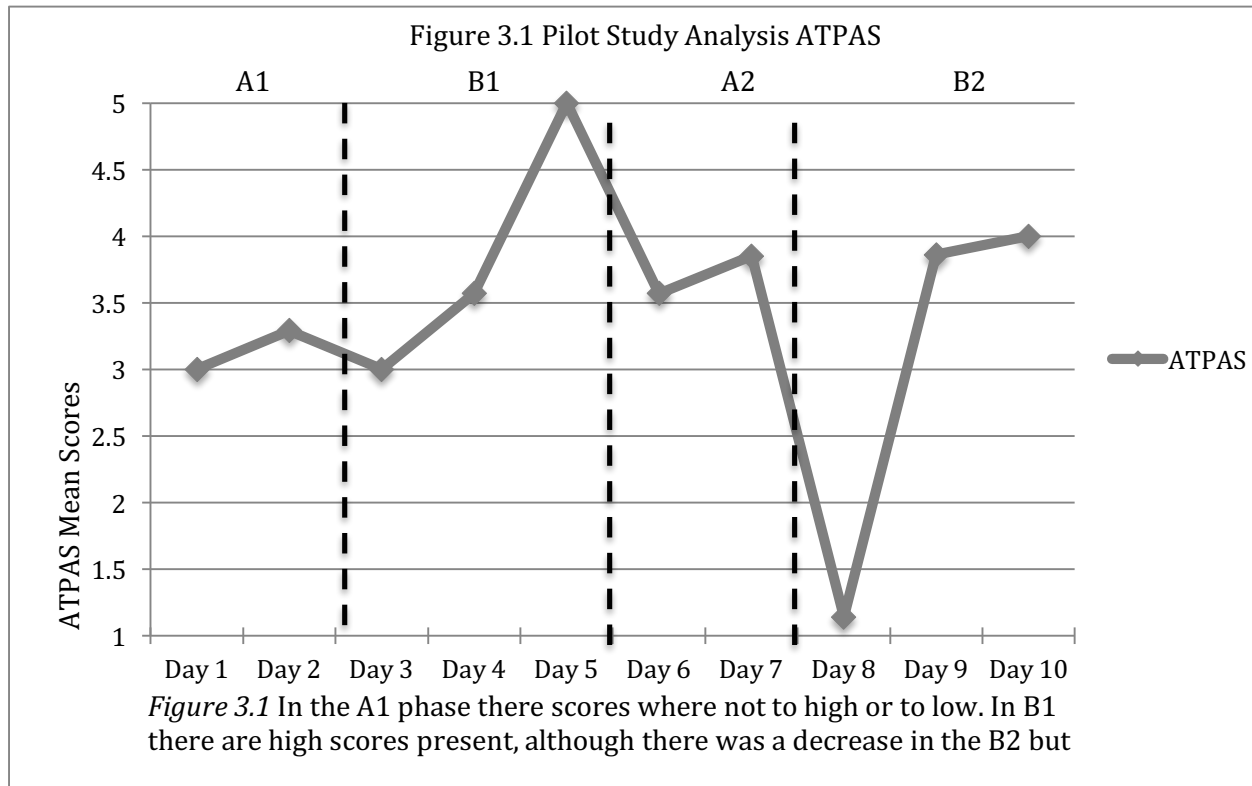
The pilot study includes 45 minutes for three days straight of water-based exercise with an instructor and a physical activity expert during the intervention stages. Those 45 minutes of water-based exercise include the warm-up and the stretching. For the purpose of the pilot study the first and second baseline lasted two days each and the first and second intervention lasted three days each. The participant had a total of four days of baseline and six days of intervention,

The first day of the baseline (A) the participant presented a medium - high positive attitude in respects to physical activity with a score of three in the Attitude Towards Physical Activity scale. There was a slight increase in the participants' attitude in respects to physical activity score from day one to day two. This could be due to the fact that the participant showed interest in participating in the study. During the interventions, on the first day of water-based physical activity the participant's score in the ATPA scale had a small decrease. This could have been because of not liking the exercise and being the first time that the participant started the physical activity in the water. "I'm not a big fan of getting in the water, but this feels nice." This information was collaborated with the field notes and interviews where the participant told the researcher how much disliked the participant had for the water. The fact of getting into the pool is something out of the ordinary for the participant. It's important to count in the factor that the



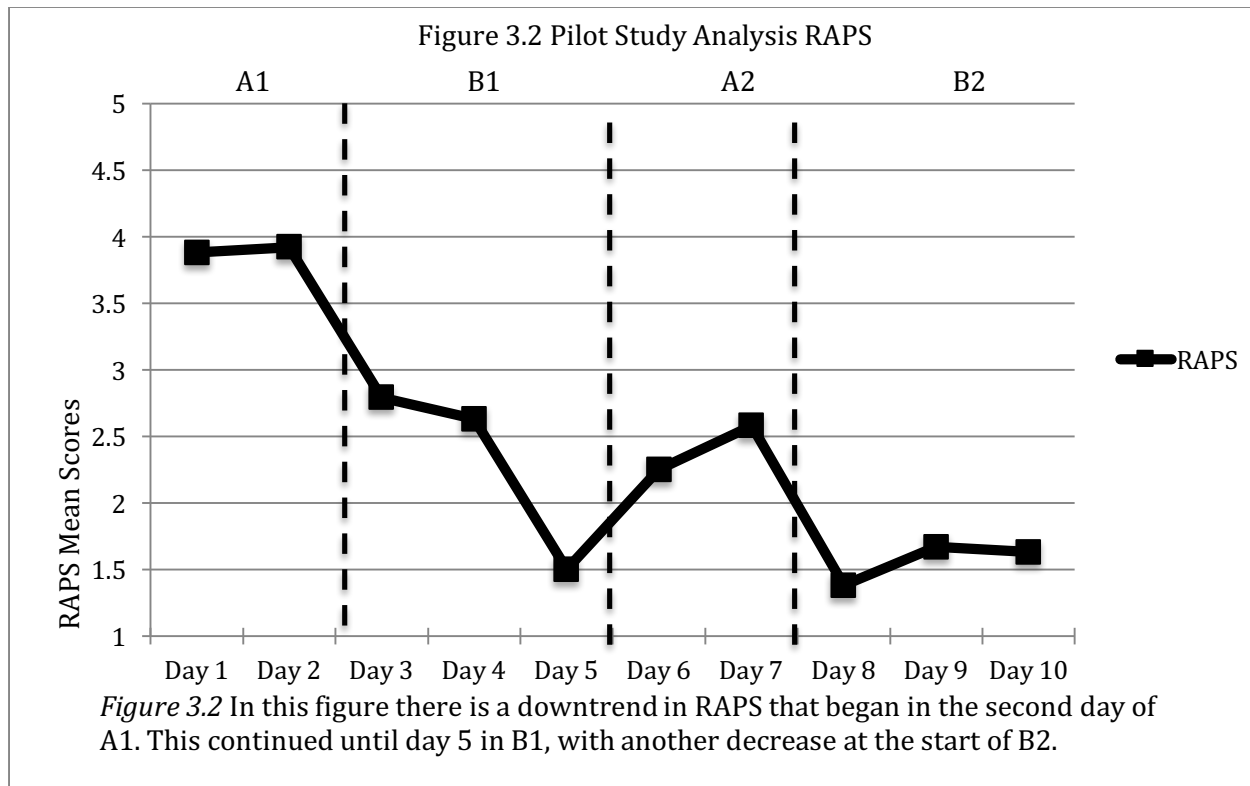
study took place during Christmas season and the participant might have not wanted to be exercising in the water because it was during cold weather. In the following two days the participant scored high numbers in the ATPA scale. During these two days the participant exercised in the interventions phases and was doing normal daily work that the participant usually does. The exercises were showing some positive change in the participant's attitude in respects to physical activity. The participant was feeling like the intervention was helping him with the condition.

Attitude towards physical activity had another drop in the scale during the first day of second baseline. It was a decrease of almost two points in the ATPA scale, but it was still not a lower score than the one in the first baseline. This was due again because of the Christmas season; the participant was not very eager to spend it exercising. The participant had to accommodate the intervention during a very busy season. As can be seen in the above figure (Figure 3.1) the incremented score in the two days in the second baseline is very similar to the increase in the first baseline. During the first day of the second intervention the participant scored very low in the ATPA scale. The low score can also be due to the fact that it was the first time getting back into the pool to exercise since the first intervention. As the participant told the researcher that the participant had gotten used to just filling up the surveys and not working-out in the pool. "... not a big fan of getting into the pool, specially during the Christmas season with all the activities going on..." During the second and third day the participants score increased drastically but not to the same high score as in the first intervention. During the intervention the participants shows high scores in the ATAP scale. The participant shared that the water-based exercises was having a positive effect on the participants' attitude in respects to physical activity. The participant noticed how moderate physical activity was helping his overall health.

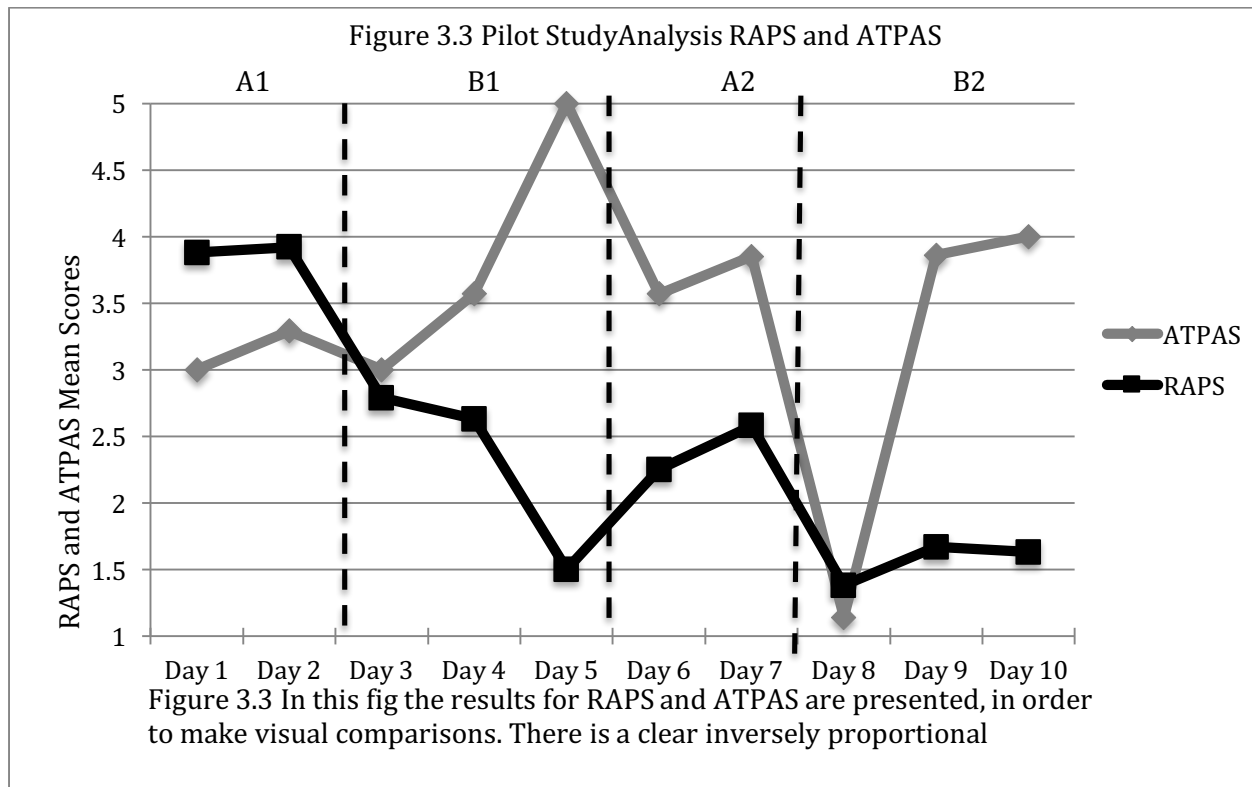


During the first two days of the baseline the participant had high scores in the Rheumatoid Arthritis Pain Scale (RAPS). Which means that the participant was in constant pain during these two days. These two days were the first baseline phase when the participant was asked to fill out the surveys. During the third day, the day after the first intervention, the participant scored low in the RAPS. This could be that the participant wasn't feeling pain from Arthritis after having doing water-based exercise for the first time. The participant mentions that the pain had not increased since the beginning of the study. The participants felt more energy after the first intervention. There is a great decrease in the participant's pain scores from day three to day five. These days are all during the first intervention phase. Then there is an increase

in the RAPS, demonstrating how the participant was feeling RA pain again after the water-based exercise stopped for the second baseline.



The changes in the scores are not a significant change. During the second day of the second intervention there is another increase in the RAPS score. The participant showed less pain and a lower score in RAPS when he started the first day of the second intervention. During the second intervention the participants pain score was lower than during any of the other three phases. The participant told the researcher in the interviews that he was able to sleep more and better during the intervention phases “After the exercises I feel I can rest more, and I also feel with more energy than before.”



During both intervention phases the participants pain from RA scores decreased from the baseline scores. These RASP scores during the interventions were lower and the ATPA scores increased. Both intervention phases showed how the participant's pain decreased while the participant's attitude in respects to physical activity increased. In the days of the intervention the participant was showing a positive change in attitude in respects to physical activity as pain from RA started to decrease.

## **Chapter 4**

### **Results**

The purpose of this study was to investigate the effects on behavioral change in respects to physical activity in participants with Rheumatoid Arthritis (RA), through water-based exercises. There were a total of four phases: two baseline phases and two intervention phases. During the baseline phases the participant filled out the two Likert Scale questionnaires the Attitude Towards Physical Activity Scale (ATPAS) and the Rheumatoid Arthritis Pain Scale (RAPS) used in the study. In the intervention phases the participant assisted to the university pool and performed the water-based exercise routine for three days a week in a university pool site. All the phases had a duration of two weeks during the nine weeks of the study, with the exception of the first baseline phase which lasted three weeks. An increment in ATPA means a positive change in behavior in respects to physical activity occurred, while an increment in the RAPS would mean an increase in pain for the participant. The results of this study will be presented individually for each of the four participants. This data and information taken from the study will help answer the research questions from the beginning.

#### **Research Questions**

1. How RA related pain and stiffness in the joints during common daily activities affect the participant's behavior in respects to physical activities?
2. Is there a change in the amount of pain that RA participants normally experience after participating in a water-based exercise program? How is the change in pain affecting participant's behavioral change in respects to physical activity?

3. After participating in water-based exercise program will RA participant want to continue any type of exercising? If so, what type of exercise?

### **Data collection instruments**

Two Likert Scale questionnaire were used in the study: the Attitude Towards Physical Activity Scales (ATPAS) (Lorig, Chastain, Ung, Shoor & Holman, 1989) and Rheumatoid Arthritis Pain Scales (RAPS) (Anderson, 2001) (see Appendix). The two questionnaires were modified to meet the needs of the study, however, their design was not altered, and therefore their validity was not affected. The ATPAS and the RAPS were used to measure each participant's attitude and behavioral change in respects to exercising before, during, and after their participation in the study. The researcher started collecting data before the study began, utilizing the interviews while field notes were taken during and after the study most of the time during the interventions. The RAPS together with the field notes and interviews offered useful information to the study as to how the participant's pain reflected on their behavioral changes. The questionnaires used lists the items from the RAPS in which each participant responded to each item that ranged from never to always. Meanwhile, the participants answered the ATPAS's items ranged from very insecure to very secure. Both questionnaires were answered and filled out by the participants every day for the entire nine weeks, which was the entire duration of the study. During the nine weeks of study observations and field notes on the participants behavior and conversations were taken throughout this time. During the interventions two interviews were held, one at the beginning and at the end of the study with each participant individually.

### **Results of Questionnaire**

The following eight bar graphs figures present the questionnaire results for each of the four participants. The results are displayed in two separated bar graphs for each of the four

participants. The questionnaires results are reported in their mean score for each day of the nine weeks of the study. Each bar (days) represents the mean score for each participant in either the ATPS or RAPS, while the Y-axis presents the mean scores for either the RAPS or the ATPAS with the units ranging from one to five accordingly. The different bar designs represent each of the nine weeks and are distributed throughout the four phases of the study, baseline and intervention. At the bottom of the bar graph there are four letters and numbers for each of the following phases: first baseline (A1), first intervention (B1), second baseline (A2), and second interventions (B2). Each of these phases was two weeks long except for the first baseline phase which was a week longer. The results were presented individually as were each questionnaire, first the ATPAS questionnaire followed by the RAPS questionnaire. The field notes taken during the entirety of the study complemented some of the participant's answers in both questionnaires. These field notes and interviews presented more information on why and how the participant was feeling during the nine weeks of the study.

## **Participant 1**

### **Interviews and field notes**

In the interviews before the interventions participant 1 mentioned having participated from some kind of exercise, normally being walking for fifteen minutes on a treadmill. Besides having a workout routine participant 1 has gluten free diet, which has helped the participant with a lot of the Rheumatoid Arthritis (RA) condition. The results for participant 1 included, less pain, better movement, less to no swelling. The participant mentioned taking some RA pain pills when the pain becomes too much for the participant to handle. Thanks to the previous exercises and the strict gluten free diet the RA pain that participant 1 experiences was not as strong, as mentioned by the participant in the interviews and field notes. Participant 1 also mentioned that

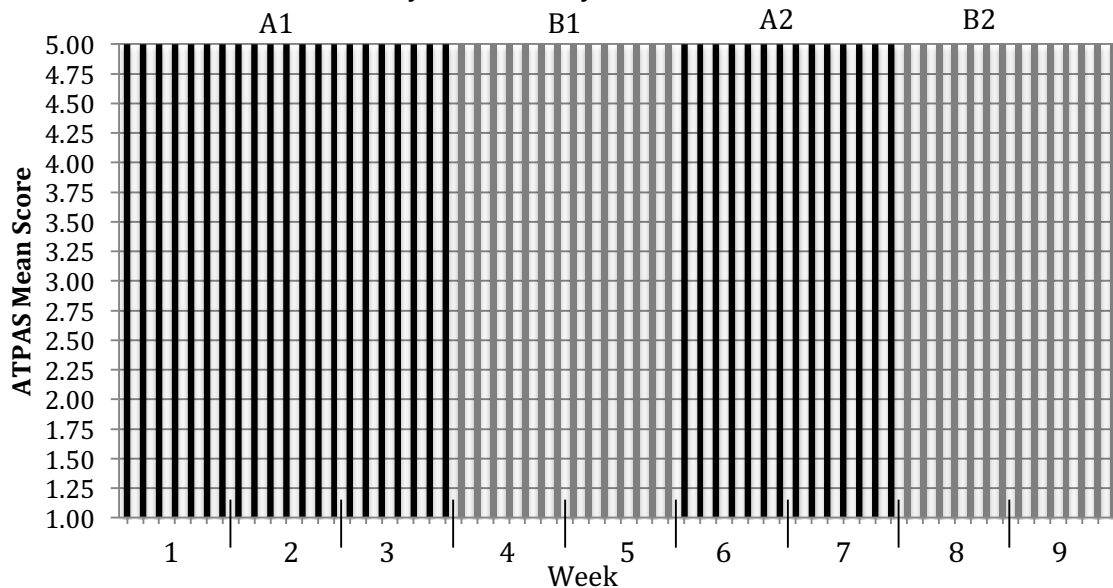
even though the treadmill exercise works a lot for her she has not been able to have a good night sleep. During the night participant 1's RA pain would not let the participant sleep or rest all that well, as the participant kept waking up. Participant 1 said: "... I have stopped taking the RA pain pills that I was taking and I feel great ...". During three days of the interventions participant 1 mentioned various times that the exercises in the pool made her relax a lot more than the exercises the participant normally did. During some intervention days participant 1 expressed the following: "These exercises make me relax a lot while I'm doing it, even after a hard day of work ...". "I've been able to sleep better ever since we started with the interventions."

### **Attitude Towards Physical Activity Scale**

Throughout the A1 phase participant 1 had a score of 5.00 from the beginning of the phase to the end in the ATPAS. The score of 5.00 in the ATPAS represents very sure to be able to do physical activity while a score of one means that the participant was very unsure to be able to do physical activity. During the B1 phase participant 1 continued to demonstrate a mean score of 5.00 in the ATPAS (See Figure 4.1). This continued from the start of the study throughout the nine weeks. In the A2 the mean score for participant 1 remained the same: a score of 5.00 in the ATPAS. In the B2 phase participant 1 maintained the high score of 5.00 in the ATPAS, while not presenting any changes in the ATPAS during the nine weeks of the study. During the increases in RAPS the ATPAS mean scores kept being high, but the participant did mention the following: "... If given the chance I would score higher in the ATPAS..."



**Figure 4.1** Mean Scores for Participant 1 in the Attitude Towards Physical Activity Scale

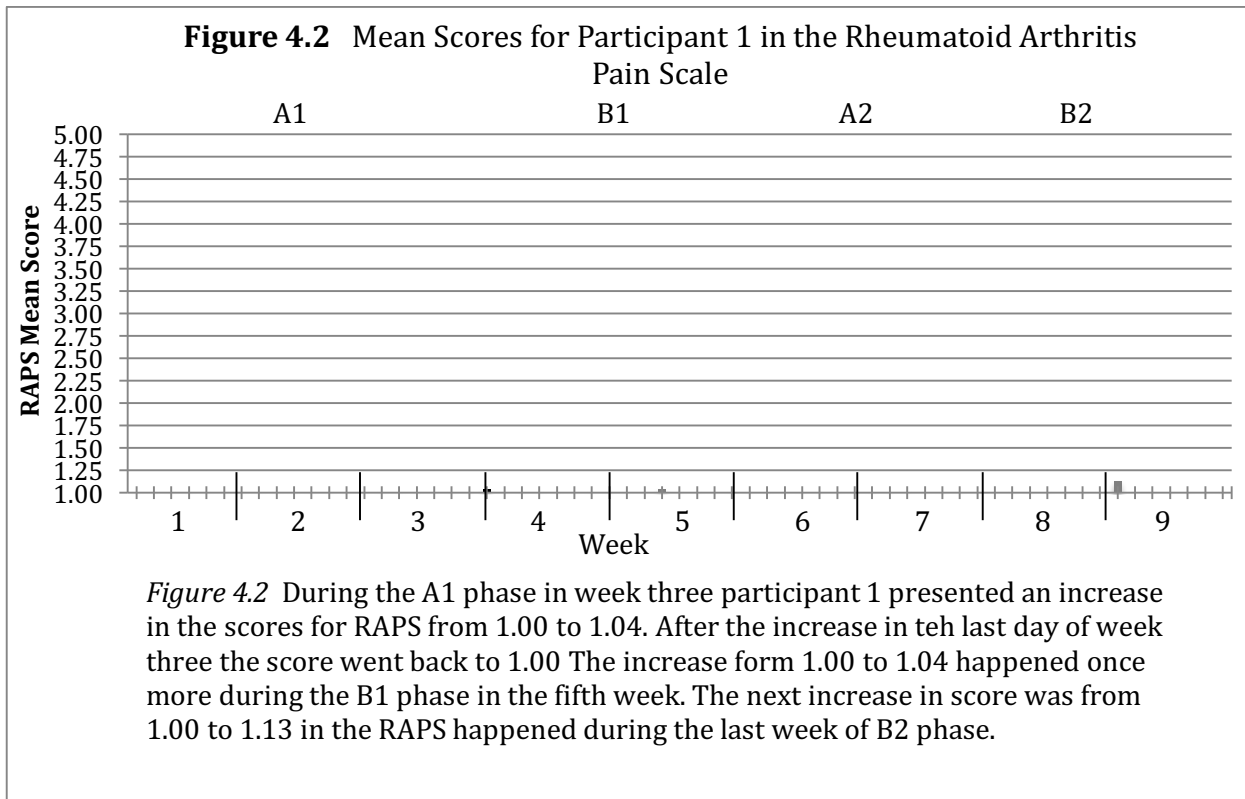


*Figure 4.1* During the entire nine weeks the participant didn't show any changes (decreases or increases) in the ATPAS mean score. The mean

### Rheumatoid Arthritis Pain Scale

Participant 1 (P1) scored a mean of 1.00 in the RAPS for each day in the A1 phase of the study, meaning no RA pain. The only change came the last day of the third week in the A1 phase, where the participant showed an increase in the score from the sixth day to the seventh day from 1.00 to 1.04 in the RAPS (See Figure 4.2). During the B1 phase the participant 1 did not show any changes in the mean score as it remained a 1.00 until the third day on the fifth week, where participant 1 presented a change in mean score from 1.00 to 1.04 in the RAPS (see Figure 4.2). This increase in the score was similar to the one that occurred during the A1 phase. During the A2 phase the participant 1 scored 1.00 in each day. This trend continued until the end of this phase and beginning of the B2 phase where participant 1 did show a higher change in the mean score for RAPS. In the B2 phase participant 1 showed the same score of 1.00 as in the previous phase until the first day of week nine in the B2. Week nine was the last day of the study.

and the last days of the intervention phases. At this point participant 1 presented the biggest increase in mean score in the RAPS during the entire study. The change in mean core went from 1.00 to 1.13 in the RAPS (see Figure 4.2).



Participant 1 presented a constant mean score in the ATPAS, during the nine weeks of the study. When compared to the mean scores for RAPS, participant 1 showed a constant score of 1.00 even though there were small increases during the interventions of the study. These occurred in the scores from 1.00 to 1.04 and from 1.00 to 1.13 (see Figure 4.2). These increases in the RAPS did not affect the participant's constant positive mean scores in the ATPAS.

## Participant 2

### Interviews and field notes

In the interviews before the interventions the participant mentioned that the RA pain increased more during the weekends, because of yard and housework. Participant 2 is not

accustomed to do any type of physical activity and does not participate from any exercise or follow any of specific diet. During the interviews and field notes, this participant mentioned needing some motivation to perform exercises; “. . . I try to force myself to workout but its hard to motivate myself all alone . . .” During the interview the participant expressed taking pills for the pain whenever the RA pain got too severe for the participant to handle. During the interventions the participant expressed: “. . . I love how the exercises [interventions] make me feel, I feel more relaxed once I finish them . . .” and the participant continued: “. . . I really needed the to relax and take my mind off of RA pain and some other situations that are happening . . .” During the B2 phase participant 2 expressed: “I feel like I have more energy during the day after exercising [intervention].” Participant 2 said during the interventions: “. . . I’ve been able to do all the yard and house work during the weekend without that much RA pain . . .” The participant wanted to continue with the interventions, as the participant said: “. . . without the motivation of the exercises (interventions), I won’t do any physical activity . . .” “. . . I force myself to come to the interventions even if I don’t feel like it, but I do it anyways because I know how it makes me feel afterwards . . .”

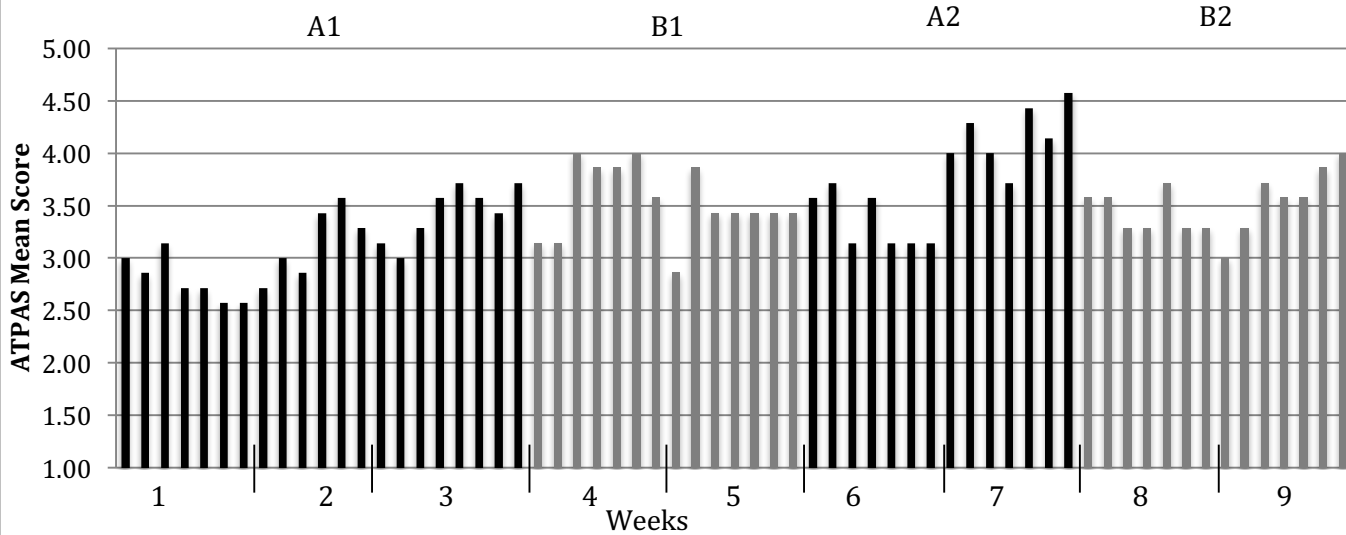
### **Attitude Towards Physical Activity Scale**

During the three weeks of A1 participant 2’s mean score for ATPAS shows an uptrend. The entire three weeks of A1 phase presented a noticeable downtrend followed by an uptrend. The lowest mean score in the first three weeks of A1 was of 2.57 and the highest score was 3.71 in the ATPAS (see Figure 4.3). The biggest increase in the participants mean score was during week two the third day until the fourth day of the second week. This increase was from 2.86 to 3.43 mean scores in the ATPAS (see Figure 4.3). At the end of the A1 participant 2 had another increase in the last uptrend before the next phase. This score of 3.71 was the highest of all of the

scores in the A1 phase, which was the same score during the fourth day of the third week of A1. During the start of the B1 phase participant 2 showed a drop in the mean scores for ATPAS. This downtrend continued followed by an uptrend. The third day of the B1 phase showed an increase in mean score from 3.14 to 4.00 in the ATPAS. After, in the B1 phase there was a decrease from 4.00 to a 2.86 during the last days of the fourth week and in the last day of the fifth week in the ATPAS (see Figure 4.3). On the second day of the fifth week in the B1 phase another increase of one unit occurred in the ATPAS. This was followed by a trend of five days with the same score of 3.43.

During the B2 phase there was an increase from 3.14 mean score in the sixth week seventh day, to a score of 4.00 in the seventh week first day. Participant 2 showed an uptrend during the second week of A2 phase. The mean scores for the A2 phase continued an uptrend until the beginning of the next phase where a decrease in mean score is presented. The beginning of the B2 phase started with a decrease in the mean score from the uptrend in the previous phase. The decrease was from 4.57 to 3.57 in the B2 phase in the ATPAS (see Figure 4.3). During the continuation of the B2 phase there was no change until the last five days where an uptrend occurred in the scores for participant 2.

**Figure 4.3** Mean Scores for Participant 2 in the Attitude Towards Physical Activity Scale

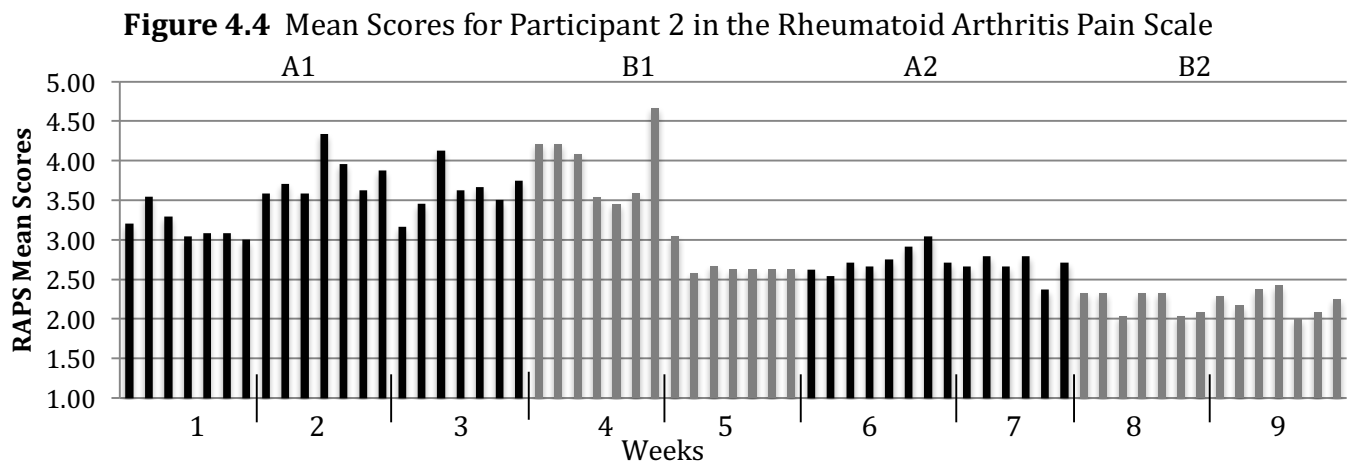


*Figure 4.3* During the A1 phase the mean scores for ATPAS presented an uptren dwith some variability. During the B1 phase the participant score a high 4.00 during the third and sixth day in week four on the ATPAS. There was another increas during the seventh week of the A2 phase reaching 4.57 score. Participant 2 presented some increases and decreases with variability during the entire study.

### Rheumatoid Arthritis Pain Scale

Participant 2 (P2) had a mean score of 3.00 or higher in the RAPS during the A1 phase. In A1 phase the highest mean score occurred in the fourth day of the second week, scoring 4.33 in the RAPS. During the third day of the third week of A1 phase, participant 2 presented a mean score of 4.12 in the RAPS (see Figure 4.4). During the first week of the B2 phase participant 2 presented high scores in the RAPS. The mean scores for the A1 ranged from as low as 3.00 to as high as 4.33. On the last day of the first week of B1 phase participant 2 showed the high score in the RAPS of 4.67. This score is the highest in the entire study for participant 2. After the 4.67 score participant 2 showed a decreased from 4.61 to 3.04. During the second week of B1 the scores decrease from 3.04 to 2.58 in the RAPS although there was no trend present (see Figure 4.4).

During the A2 phase participant 2 kept presenting low scores as in the previous phase although there was an uptrend during the end of the first week of A2 phase. The uptrend is followed by a downtrend in the RAPS mean scores. The highest score in these two weeks of the second baseline was 3.04 mean score. The last day of the second baseline participant 2 presented 2.71 mean score in the RAPS (see Figure 4.4). There is a downtrend with variability that occurred from the last day of A2 to the entire B2 phase. Participant 2 showed a score of 2.71 in the last day of A2, which decreased to a 2.33 score in the first day of B2 phase. The lowest score during the B2 the participant presented was a value of 2.00 in the RAPS.



*Figure 4.4* Participant 2 presented increases and decreases with variability during the first three weeks of the study. This ended in the fourth week of the B1 phase, where a downtrend started. This downtrend continued until the end of the study, there was ofcourse some variability in some of the days between week four and week nine. For example the last day of the fourth week the score increased to a high 4.67.

Participant 2 did not show any trend during the beginning of the study however there was an uptrend with variability in both variables during the second week. However, there was an increase in ATPAS while at the same time a decrease in RAPS was registered. During the last

days of the study there was an uptrend with variability in the ATPAS. While the mean scores for RAPS decreased the ATPAS increased.

### **Participant 3**

#### **Interview and field notes**

In the interview participant 3 mentioned how painful the RA condition had gotten. RA pain has gotten to the point that the participant is in constant pain during the entire day while having its peak during the hours of the morning. In the weekends participant 3 does not engage in any type of exercise but does participate from physical activity, which include climbing and hiking. Sometime before the study participant 3 used to engage in Aqua-Zumba classes, but the participant mentioned: “. . . I miss Aqua-Zumba but I feel like this exercises [interventions] I can do them better and easier than some of the movements required in that class . . .” Although participant 3 has not recently engaged in physically activity, the participant tries to do stretches every day during the early hours of the morning. It was recorded in the field notes that participant 3 voiced the following: “. . . during the exercises I feel so light that I forget about the pain caused by my RA condition . . .” During the B2 the participant voiced the following: “. . . I was feeling a lot of pain during the first exercises but now I can do them easier and they don’t provoked any type of RA pain . . .” Participant 3 mentioned during the last days of intervention: “. . . I want to continue doing these exercises . . .”

#### **Attitude Towards Physical Activity Scale**

During the A1 phase the participant showed an uptrend within the first two weeks of the phase. There was a decrease in the mean scores for ATPAS from 4.57 to 4.00 the first day of the third week of A1 phase (see Figure 4.5). This decrease in the mean scores continued until the beginning of the next phase. The participant started the transition from A1 phase to B1 phase

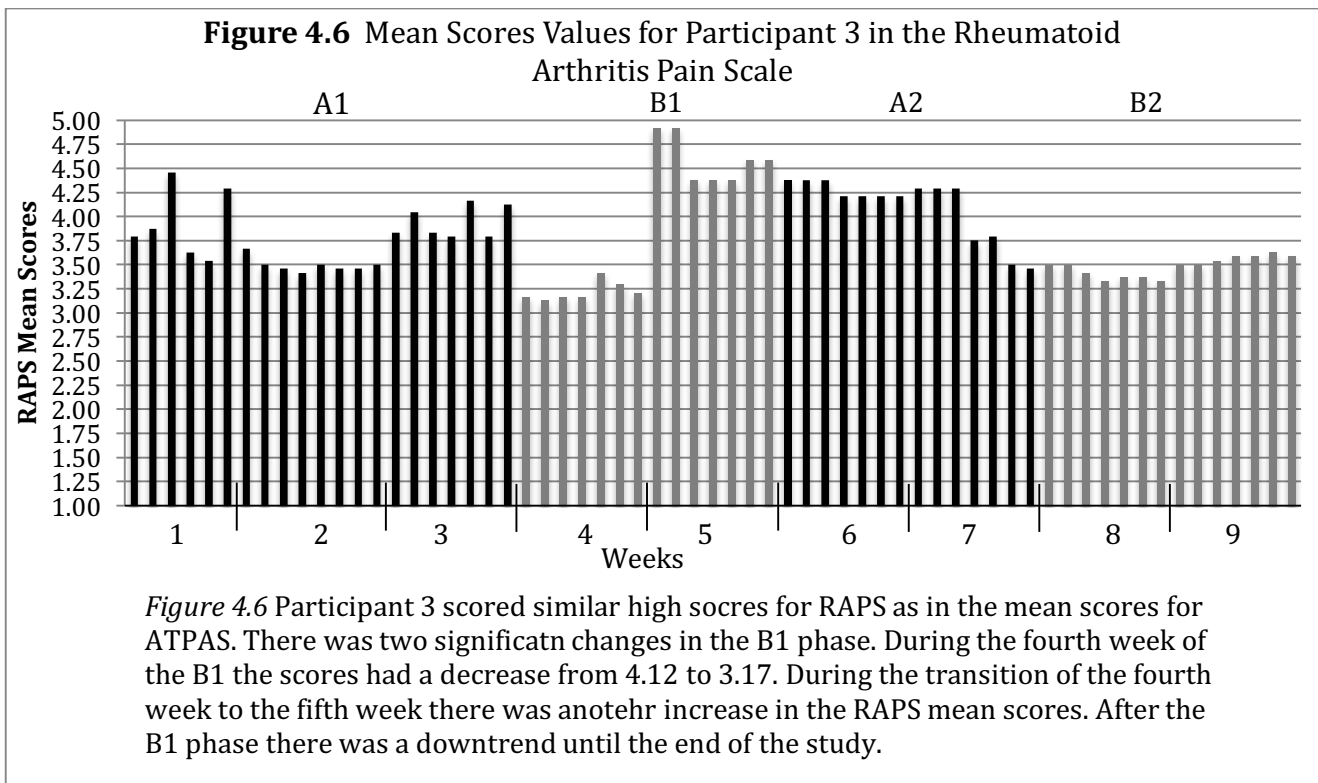
with a decrease in the mean score for from 4.14 to 3.00 in the ATPAS. These decreases were followed by an increase with variability for the duration of the B1 phase. The biggest increase came during the transition of fifth week in the B1 phase to the sixth week of B1 phase where the scores had an increase from 2.86 to 3.57 in the ATPAS. During the sixth week of B1 phase the mean scores of 3.43 continued until the he last two days where there was an increase to 3.71, heading in to the sixth week of A2 phase (See Figure 4.5).

During the A2 phase participant 3 presented a increase with variability in the sixth week. There was a small decrease from 4.14 to 3.71 in the mean scores in the transition from week six to week seven of the A2 phase. The decrease to 3.71 lasted for the first two days of the seventh week. This scores were the same as the last two days of the fourth week in the B1 phase. After the first two days in the seventh week participant 3 presented another increase in score from 3.71 to 4.14 for ATPAS, followed by a decrease in the last day of the seventh week before the B2 phase. During the B2 phase the participant showed a downtrend in the score from 4.00 to 3.43 during the first three days of the ninth week in the ATPAS. After the first three days in the ninth week an increase with variability is visible at the end of the last four days of the last week of B2. The scores increased from 3.43 to 4.14 during days four and five of the ninth week, and then a decrease to 4.00 in the ATPAS (see Figure 4.5).





day to the fourth day of the seventh week (See Figure 4.6). The decrease continued with some variability until the ninth week of the B2 phase where it changes into an uptrend during the second week. The mean score increased from 3.50 to 3.63 in the RAPS during the second week of B2.



ATPAS. It is not clear to see an effect from the intervention on the participant. Although there is no trend participant 3 ended with a higher mean score in ATPAS than in the RAPS.

## **Participant 4**

### **Interview and field notes**

The participant suffered from constant RA pain during the day and night but it gets worst during the morning. For the participant the RA pain affects his sleep as well as being able to move with ease in the worst days. During the first day of the B1 participant 4 had to use the elevator chair to get in the pool. After the first two days the participant was already getting in and out of the pool without the need of any assistance. During the interview before the study the participant mentioned once having started a pattern of going on brisk walks around the neighborhood but sometimes the pain did not let the participant do it. Participant 4 said: “. . . during the mornings the pain in my fingers and bones make it difficult for me to get up . . .” “. . . I started walking around my neighborhood again and this time the pain is not there while I walk . . .” Participant 4 said: “ I’m sleeping a lot better now since I started with the water-exercises [interventions], also I feel more tired when I get home so I rest better.” During the last few days of the B2 participant 4 mentioned: “. . . I feel stronger in the mornings the days after the exercises [interventions] we do here . . .”

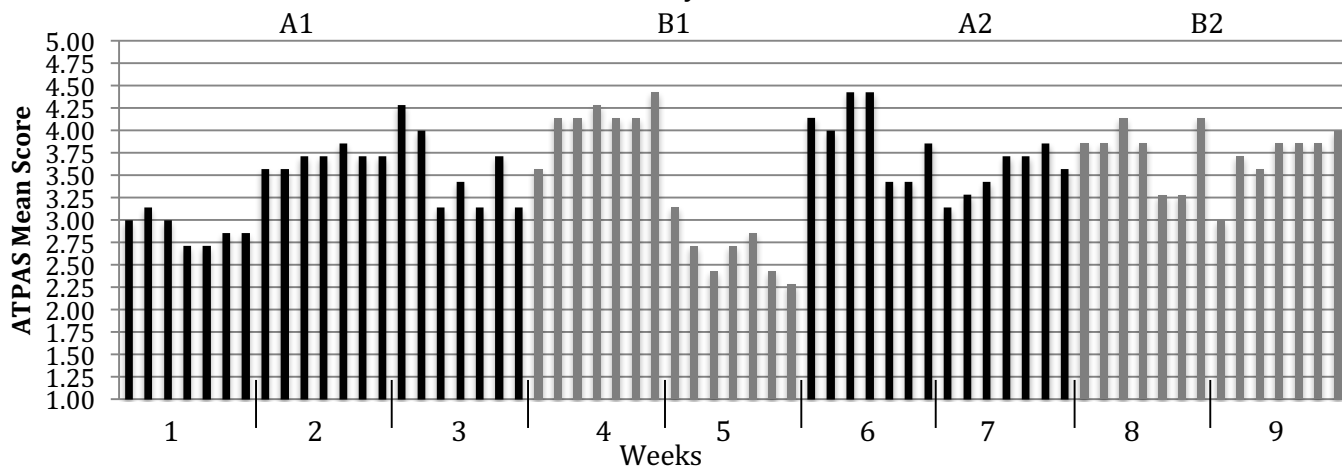
### **Attitude Towards Physical Activity Scale**

During the A1 phase the participant showed a downtrend from day two until the fourth day of the first week. This was followed by an uptrend starting in day five all the way to the first day of the third week of A1, both with variability. The highest score during the A1 phase was 4.29 in the ATPAS while the lowest mean score in the A1 phase was of 2.71 (see Figure 4.7). In the last day of the third week in the A1 phase the score decreased from 3.71 to 3.14 in the

ATPAS. There is an uptrend during the beginning of the fourth week of B1 phase and continued increasing to a 4.43 score in the ATPAS. This uptrend continued all the way until the last day of the fourth week. The first day of the fifth week in the B1 phase presented a downtrend with a low mean score of 3.14, which decreased to as low as 2.29 in the last day of B1 phase (see Figure 4.7).

Participant 4 presented an uptrend with variability in the score from last day of B1 to the start of the A2 phase. The increase in score from B1 to the A2 phase was from 2.29 to 4.14 in the ATPAS (see Figure 4.7). On the third and fourth days of the A2 the scores reached the high score 4.43 and then decreased to 3.43, which then increased to 3.86 in the last day of the sixth week. At the beginning of the seventh week of the A2 phase the score decreased from 3.86 to 3.14. During this second week of the A2, the participant presented an uptrend in the second week of A2 phase that was only interrupted by one day at the end of the A2 showing a decrease of 3.57 in the ATPAS (see Figure 4.7). The score for ATPAS decreased from 4.14 to 3.00, which was the highest score in the eighth week of the B2. The score of 3.00, which was the lowest in the B2 phase, was also the score on the first day of the ninth week of the study. This first day of the ninth week marks the beginning of an uptrend with variability in the last week of B2. The uptrend in the ninth week continues until the last day of B2 phase the participant showed a 4.00 in the ATPAS.

**Figure 4. 7** Mean Scores for Participant 4 in the Attitude Towards Physical Activity Scale



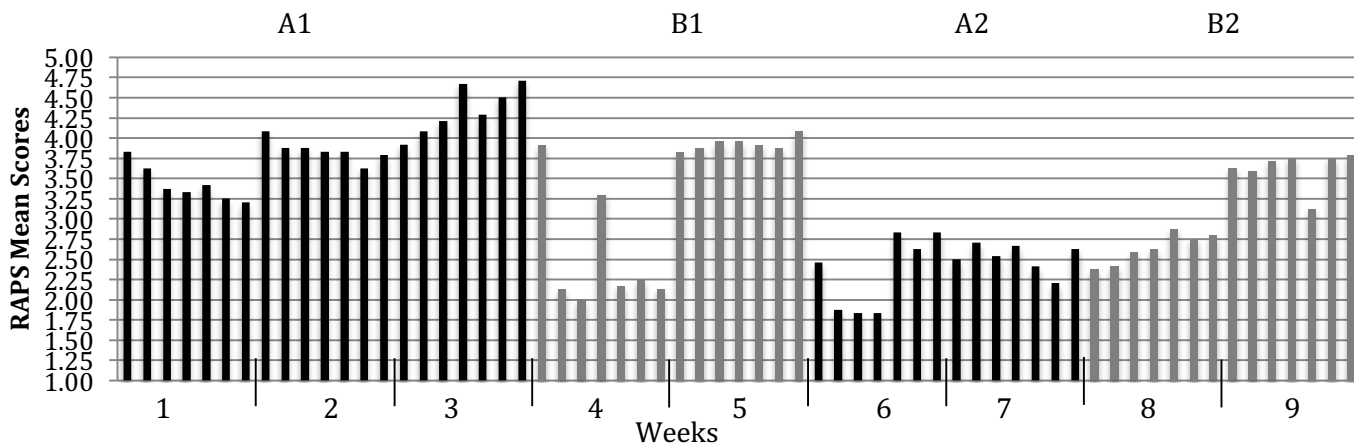
*Figure 4.7* Participant 4 presented downtrends and uptrends during the entire study with variations in some of the days. The ATPAS score decreased from 4.43 to 3.14 during the fifth week of the B1 phase. There was another increase during the beginning of A2 phase. The B2 phase presented higher scores different from the B1 phase. The last weeks of the study presented high results for the ATPAS scores.

### Rheumatoid Arthritis Pain Scale

Participant 4 began the A1 phase with a downtrend in the mean score for RAPS that began from 3.83 to 3.21 the last day of the first week. This downtrend was interrupted only by variability in day five of the first week where there was an increase in the score from 3.33 to 3.42 (see Figure 4.8). Besides day five in the first week the downtrend continued until the start of the second week of A1. The downtrend was interrupted by an increase in RAPS of 4.08 mean score the first day of the second week of A1 phase. There is an uptrend that began during day seven of the second week in the A1 phase and continued until the day five of the third week of the A1 phase. Participant 4 presented a downtrend that started with the first day of B1 phase, the mean score was decreased from 4.71 to 3.92 in the RAPS, while the downtrend continued next two days showed a decrease in score from 2.13 to 2.00 (see Figure 4.8). The score of 2.00 was the lowest score for participant 4 during both interventions. The downtrend continued with the

interruption of the fourth day of the B1 with a high score of 3.29. After the first week of the B1 phase, there was an increase in mean score in RAPS of 3.83 the first day of the fifth week. These high scores continued through the entire second week of the B1.

During the beginning of the A2 phase, there is a downtrend of mean scores in RAPS, from 4.08 in B1 to 2.46 in the first day of A2 phase. This downtrend continued for the first four days of the A2 in the fifth day of the B2, the participant showed an increase from 1.83 to 2.83 in the RAPS (see Figure 4.8). From this increase there is no trend but there is variability in the mean scores until the start of B2 phase. The change from A2 phase to the B2 phase was from 2.63 to 2.38. The last day of A2 presented a score of 2.63, which then decreased to 2.38 for the first day of B2. This is followed by an uptrend in mean score for participant 4, which was interrupted the fifth day of the second week of the B2 phase, where there was a significant decrease from 3.75 to 3.13. Following this decrease the two days left in the ninth week continued the increase in the score to 3.75 and 3.79 the sixth day and seventh of the ninth week of B2 phase.

**Figure 4.8** Mean Scores for Participant 4 in the Rheumatoid Arthritis Pain Scale

*Figure 4.8* The participant started the A1 phase with a downtrend that ends in the first day of the second week. After the increase in scores for the second week the participant showed another decrease until the sixth day of the second week. The decrease in RAPS was more significant during the fourth week in the B1 phase. After the seventh week of the A2 phase there is a clear uptrend in the RAPS scores. As happened in B1 the second week of that phase had an increase in

Participant 4 showed multiple trends during the entire study specially presenting a mirror kind of relationship between the two questionnaires RAPS and the ATPAS. The participant said during the interventions: “... every time I do the exercises I feel a lot more able to move without pain and without feeling like I won’t be able to perform that action, it’s a great feeling that I didn’t have before the water-based exercise.” This cause and effect relationship between both scales shows the participants increased mean scores in ATPAS with uptrends while at the same time displaying some decreases and downtrends in the RAPS. While at the same time presenting decreased and downtrend in mean scores for ATPAS and increases and uptrends in the mean scores for RAPS.

In the next chapter the results will be on line graphs to be analyzed visually through the use of the field notes and interviews with the participants. Also in the following chapter the researcher will compare and analyze the results of the study with the research questions and the

study Hypothesis. The researcher will visually analyze the results using the field notes and interviews with each of the participants during the following chapter.



## **Chapter 5**

### **Data Analysis**

The purpose of this study was to investigate the effects on behavioral change in respects to physical activity in participants with Rheumatoid Arthritis (RA), through water-based exercise. The study introduced the participants with RA to physical activity through a water-based exercise program. There were a total of four phases that included two baseline phases and two intervention phases. During the baseline phases: first baseline (A1), and second baseline (A2) the participant filled out the two questionnaires used in the study the Attitude Towards Physical Activity (ATPAS) and the Rheumatoid Arthritis Pain Scale (RAPS) each day. In the intervention phases: first intervention (B1) and second intervention (B2) the participant would assist to the university pool facilities and engage in water-based exercise for three days a week, besides filling out the questionnaire. The order for the phases was as followed: A1 for three weeks, B1 for two weeks, A2 for two weeks, and B2 for two weeks.

Field notes were taken during and after the study began, during the interactions with the participants in the interventions. Interviews were done with each participant before the B1 phase to complement the information on how the intervention of the study affected their behavior in respects to physical activity. For better understanding of the following analysis it is important to acknowledge that an increment in ATPAS means a positive change in behavior in respects to physical activity. The results of this study will be presented and divided into the four participants.

### **Research Questions**

1. How RA related pain and stiffness in the joints during common daily activities affect the participant's behavior in respects to physical activities?

2. Is there a change in the amount of pain from RA after participating in a water-based exercise program? How is the change in pain affecting participant's behavior in respects to physical activity?
3. After participating in water-based exercise program will the person with RA wants to continue exercising? If so, what type of exercises?

Two Likert scale instruments were used; the RAPS (Lorig, Chastain, Ung, Shoor & Holman, 1989) and the ATPAS (Anderson, 2001), which were filled out and collected every seven days during the nine weeks of the study. These data were plotted into a scatter graph for each of the participants containing both RAPS and ATPAS results. The RAPS and ATPAS data are going to be in the same graph in order to do the visual analysis (See Figure 5.1). Each of the phases had a black ragged line, which divided each of the four phases. The X-axis represents the nine weeks of the study, while each dot in the line represents a day. The Y-axis in the four figures represents the mean scores for both the RAPS and the ATPAS. For the RAPS's line, the number one represents never and five represent always. While in the ATPAS's line, the one represents very unsure and five represent very sure. The color gray and a square shape represent the scatter line for ATPAS. The RAPS scatter line is represented in black color with a diamond shape. A line will be crossed between the dots in order to create a visual comparison of the data and to notice any type of trends.

The presentation of behavioral data is of utmost importance in determining if clinical significance has been achieved (Bailey & Burch, 2002). As Bailey and Burch (2002), continue to emphasize that the purpose of the visual analysis is to find and discover functional relationship between the changes in environment and social significant behaviors. Each participant had one graph with the data for both questionnaires results. These graphs are helpful for a visual analysis

in order to answer the research questions. With visual analysis what you see is what you get in terms of behavioral data (Bailey and Burch, 2002). The graphs visual comparison together with the interviews and the field notes were a key instrument in answering questions about the amount of RA pain and its relationship with the participant's behavior in respects to physical activity.

### **Profile of Participant 1**

Participant 1 normally exercised 15 to 30 minutes every day on a treadmill during the mornings. The participant was in a strict diet, which was of not consuming foods that contains gluten. This protein is found in grains such as wheat, barley and rye. The participant work hours are mostly spent sitting in an office or in work meetings, with minimal physical activity. This participant was normally having trouble sleeping during the nights and sometimes it was due to a burning pain sensation in the joints. “ . . . there is this burning feeling that I have sometimes which *stops me from having a good rest during the night . . .*” Participant 1 had to assist to some of the interventions without the other participants due to some scheduling problems. This was actually helpful as the participant started to do more complicated exercises, and became a peer example to the other participants. These more complicated exercises were adaptations in complexity from the exercises normally done in the interventions. Participant 1 only showed three changes in the RAPS scores during the entirety of the study (see Figure 5.1). The participant showed an increase in RA pain during the last day of A1. This increase shows that the participant was presenting random RA pain before the intervention started. The other two changes occurred in the B1 and B2 phases. The increase in the B1 was the same as the one in A1 from 1.00 to 1.04, but this time the water-based exercises had started. During the interview process this participant mentioned: “I think I’m going to keep doing the treadmill exercises during the mornings.” This increase in RAPS score during B1 was due to the participant wanting

to do the interventions and also maintaining the treadmill exercise. The water environment was something different from the common treadmill exercise for the participant. The participant presented some increases in RAPS but no decreases in ATPAS, meaning that the participant's already positive attitude in respects to physical activity was not affected in any way.

The concept of the Health Belief Theory is that health behavior is determined or can change by a person's own beliefs or perceptions of a disease and the strategies available to decrease its effects (Jones & Bartlett, 2009). Participant 1 was already doing physical activity in a treadmill, which explains why the participant started with the highest scores since the beginning. "I've been able to sleep better ever since we started with the interventions [water-based exercises]." During the field notes the participant mentioned that if given the chance to score higher in the ATPAS the participant would. The third and last increase in RAPS score came during the B2 phase. In this phase the participant had an increase from 1.00 to 1.13 in RAPS while still not presenting any change in ATPAS. The participant had stopped doing the treadmill exercises and was just doing the water-based exercises and also mentioned in the field notes the following: "... I talked to my doctor and decided stop taking the RA pain pills that I was taking and I feel great ...". The intervention had an estimated duration of one hour, more time than what the participant did in the treadmill.

In the ATPAS the participant showed some high scores and did not change during the entirety of the study. Participant 1 was always positive in respects to having an active live. Although, there were not any visible changes in the ATPAS score, the participant mentioned feeling a lot better when it came to resting. The better sleep for participant 1 happened in the same weeks as the changes in pain at the intervention phases. Having a better sleep shows a relationship between the water-based exercises and being able to sleep at night. These exercises

gave the participant a more positive result than the other type of exercises did not. Besides offering support to the joints water makes a unique resistance for muscles, making them stronger and healthier. Anyone can participate from water exercises by simply walking in waist or neck deep water level (Arthritis Today, 2013). The participant mentioned: "... If given the chance I would score higher in the ATPAS..." Participant 1 experienced slightly more pain during the intervention phases the participant was able to sleep better and rest more: "... I'm resting better when I do the exercises [interventions] than when I don't do the exercises..." This did not affect in a negative way the participant's attitude in respects to physical activity. Participant was doing the treadmill workout but when the interventions began the participant felt rested.

These changes, although positive did not have any effect in ATPAS as the participant was already scoring the highest possible value. The water-based exercises brought the participant relaxation and stress free environment that the treadmill workout did not. The water-based exercises offered the participant a more controlled physical activity, than the treadmill. Like it was mentioned before the water offers some controlled resistance, which made participant 1 worked harder during the exercises. These water-based exercises helped the participant with the burning sensation pain during the nights. Before the intervention, the participant mentioned that was not able to get much sleep and that it had become difficult to sleep for more than five hours consecutively: "These exercises make me relax a bunch during and after I do them, even after a hard day of work . . . ". The water was having a relaxing effect on the participant, as sometimes in the interventions the participant would stay a few more minutes just floating and moving in the water. During the intervention phases the participant had scheduling problems that most of the time was forced to exercise apart from the other participants. The days that the participant was able to engage in the interventions with the other participants in the study, participant 1

became a peer example that the other participants looked on, as someone who had dealt with the RA condition. The other participants saw the example of participant 1 as someone with the same RA condition but that was actually in no RA pain. This action by the other participants is what the Health Belief Theory explains as Perceived Benefits and Perceived Susceptibility. As the Health Belief Theory explained, a person might be more willing to change their behavior to a more positive one if they feel capable of perform the actions. The participant also showed a type of modeling by others as the Self-Efficacy states. This participant was a comparable peer for the other participants. As the theory states that the participants are affected by vicarious experience or modeling by others, social persuasion and evaluative feedback.

Participant 1 was a more physically active participant than the rest; making the participant work harder during the water-based exercises [interventions], always looking for difficult adaptations that could be added to the movements in the water. Participants were looking to imitate or push themselves as well. Example of these challenges were: using a floating board in order to make the surface area wider for more water resistance, adding more speed to the movements, and at sometimes not utilizing the help of the physical activity experts in the pool. As explained before, water offers resistance to movement so the faster the person moves the stronger the resistance by the water. Participant 1 might have pushed too much during the intervention thus the change in the RAPS. The participant achieved a better rest and sleep during the weeks after the interventions, meaning that at the same time of the increase in pain was present in the RAPS from 1.00 to 1.04 and from 1.00 to 1.13 the participant was having a better sleep and rest.

The participant's knowledge of wellness thanks to exercising demonstrated to be the reason while the participant's scores in the ATPAS were high from beginning to end. The

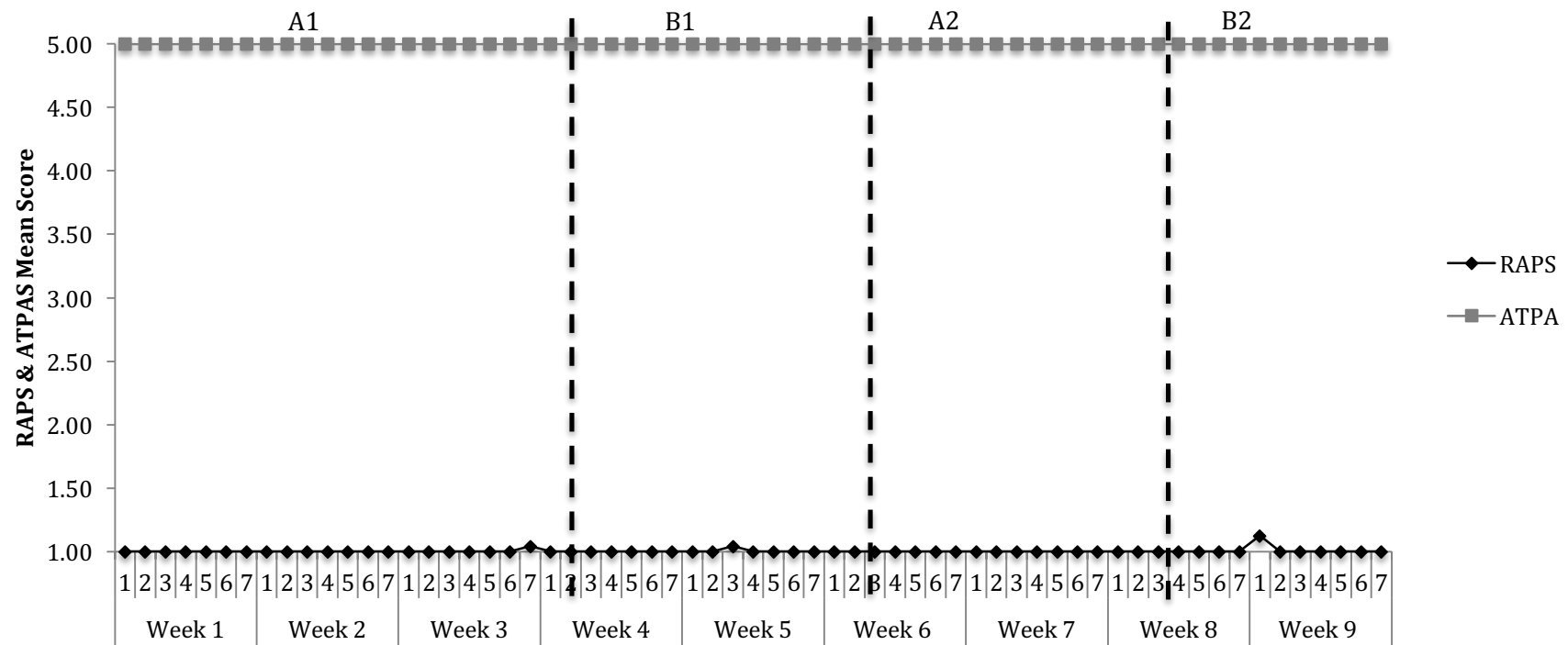
participant results in ATPAS reached the maximum score from the first day of the study and continued on to the very end. There was no change in the scores for ATPAS because they were already high, but the participant did have some positive changes in respects to physical activity in the water, due to the better sleep. The participant felt better when doing the water-based exercises than the other exercises in the treadmill. This is why the participant at one point decided to swap the treadmill exercises for the water-based exercises. The participant noticed how the water-based exercises do provide something more than physical activity out of the water for people with RA.

### **Research Questions**

Participant 1 presented RA pain just during three days in the entire study, and mentioned having felt only a burning sensation from the RA condition. Like in the rest of the study the participant did not showed any changes in the ATPAS when presenting changes in RAPS. Although the participant was reporting low scores in RAPS during the study there were changes that occurred during the first days of water-based exercises during the interventions. After the interventions started the participant had three increases in scores for RAPS. These small increases in RAPS did not affect the participants' positive attitude in respects to physical activity.

The participant noticed the differences between the normal exercises and treadmill with the water-based exercises. After starting the water-based exercises the participant felt better night rest. Participant 1 tried to continue doing exercises in the water, whenever the participant had a chance, sometimes at the university pool and also at the beach, but for the most part the participant continued with the treadmill, as it is more accessible for the participant.

**Figure 5.1** Mean Scores for Participant 1 in Rheumatoid Arthritis Pain Scale & Attitude Towards Physical Activity Scale



*Figure 5.1* There was no change in the ATPAS mean scores with a constant 5.00. While in the RAPS the participant presented three different increases, one during day seven of A1, during third day of the fifth week of B1 and during day one of the ninth week in the B2.



## Profile Participant 2

This participant does not work out regularly during the week or the weekend, meaning that the participant is not physically active. Participant 2's profession is one that is constantly sitting in front of a computer and rarely engaged in any moderate to vigorous physical activity except for going up and down the stairs. An interview was done at the beginning, before the B1 phase while the field notes were taken during and after the water-based exercises. During the weekends the participant engaged in physical activity by doing some gardening and yard work. Gardening work is considered to be light to moderate exercise (CDC, 2015). These sporadic physical activities explained the changes during the A1 phase where the RAPS scores were increasing and decreasing but staying in a general high score (see Figure 5.2). Participant 2 does not partake of any specific diet, but does have RA pain pills that were given by the doctor. The participant uses the pills only when pain gets too strong to tolerate or if it starts to limit the participant's physical activities.

During the first week of A1 the participant presented low scores in ATPAS, while presenting higher scores for RAPS (See Figure 5.2). It is not until the second week that an uptrend in both ATPAS and RAPS are presented. This result showed that the participant was having random increases in RA pain before starting the interventions. The high scores in ATPAS were due to the participant's attitude since before the study: "I normally feel a lot of RA pain, specially during the weekends, but I fight through it, sometimes taking pain pills." As presented in Figure 5.2, the uptrend in RAPS began during the weekend, as the participant mentioned before. After the second week of A1, there is a small decrease that occurs while finishing the weekend. During the third week of A1 the participant presented another increase in RAPS and an uptrend in ATPAS, just as it had happened before during the weekends of the first and second week.

During the B1 phase the participant 2 presented another increase in RAPS from 3.71 to 4.21. This was different from the other three weeks of A1 phase, where the participant scored high in the weekends and during the first days of the week the scores would then decrease. This difference is due to the participants first time doing the interventions and getting used to the water-based exercises. Even with the increase of pain in RA the participant voiced the following: “. . . I love how the exercises [interventions] make me feel, I feel more relaxed once I finish them . . .” This is also visible as the scores for RAPS remained high during the beginning of week four in the B1 phase. The decrease began on the fourth day of the fourth week with a decrease from 4.00 to 3.50. At the end of the fourth week in the B1 phase the participant presented an increase from 3.58 to 4.67 in the RAPS. This was due to the participant getting used to the activities in the water during interventions. This increase of 4.67 in RAPS occurred during the weekend of B1; the same occurred during the A1 phase with the introduction of water-based exercises the participant’s RA pain went higher. While this increase was occurring in the RAPS there was simultaneously a decrease in ATPAS scores. The pain got to the point where the participant felt incapable of doing more physical activity. “This week of first exercises, I have felt a lot of RA pain the days after the exercises.” Although the participant was feeling not capable of doing the exercises, the participant did not miss one day of interventions.

When week five began there was an inversely proportional relation between the scores in ATPAS and RAPS. From the start of week five the scores for ATPAS increased while the RAPS scores decreased. During day four of the fifth week the score for RAPS was 2.63 (see Figure 5.2) all the way to day one of the sixth week in the A2 phase. Inversely proportional for the ATPAS scores, a low 2.63 until the first day of the sixth week where the score increased to 3.57 in the A2 phase. During the A2 phase the participant continued this inversely proportional relation between ATPAS and RAPS until the first day of the seventh week where the participant had a score of 4.00 in the ATPAS. The ATPAS scores

were increased while the RAPS scores decreased to a 2.71 in the first day of the seventh week. The inversely proportional relation between the mean scores of ATPAS and RAPS that started in the fifth week shows how the participant needed time to adjust to the intervention's water-based exercises. Participant 2 mentioned: "... feeling more energy *after participating* from the interventions...", after some difficult and stressed filled weeks. The participant began to have problems finding motivation in going to the interventions due to RA pain and personal problems. Because of those same stresses and problems, the participant decided to assist to all the interventions: "It was a way to get out of the stresses and worries of life." The interventions helped the participant cope with the stress from work and personal life. The Health Belief theory states that a person's change in behavior can be affected due to the Perceived Susceptibility. Meaning that negatives effects of not engaging in the water-based exercises made the participant assist to all of the interventions. The Perceived Susceptibility for participant 2 was present during these stressful times. Added is the Perceived Benefits theory that was present during the participant's decision to keep assisting to the interventions. As the participant was not motivated to assist to the interventions at the beginning but continued engaging in the water-based exercises knowing that it would be relaxing.

As explained in chapter two the Health Believe model plays an important role in each participant behavioral change. During the study the participant had family problems and inconveniences that complicated the participant's interventions. These family problems could have prompted the participant to stop engaging in the interventions; fortunately the participant never missed a day during the study. One important element of the Health Believe model is the Perceived Benefits versus the Perceived Barriers. Participant 2 perceived barriers were the different and many family problems that were happening during the entire study. This Perceived Barrier versus Perceived Benefits theory states that the participant will pit a battle between the benefits of engaging in water-based exercises against the

obstacles the participant will or has encountered in the past. Perceived Benefits were also present, as the participant had felt positive in respects to physical activity after the first intervention. Even though the participant was having many personal problems the perceived benefits of the interventions were causing a big enough change in the participant behavior in respects to physical activity that the participant decided not to miss an intervention. This information was verified with the interviews and field notes taken where participant 2 would voice: "... after the interventions I feel like I can do any type of physical activity without limitations because of pain..." At times it became an effort to assist to some of intervention, but afterwards the participant would feel energized because the water-based physical activity worked as a relaxation activity as well for the participant. The participant's RA pain showed how much pain the disease was having on the participant. The Self-Efficacy Model states that the participants have different elements to change a behavior positively. Some of those elements are examples by others [participant 1] and past experiences. Some participants were sharing their diets or ways to deal with Rheumatoid Arthritis pain.

As with the other participants, Participant 2 had some changes in their own self-efficacy during the progression of the study. For example during the intervention the participant had to do certain exercises and at first was not feeling comfortable or executing the movement correctly. As time passed on and the interventions continued the participant started feeling more confident and more comfortable in doing those same exercises and movements. Not utilizing the physical activity expert's help and depending solely on the participants own strength. These continued for much of the other exercises even to the point where there had to be some harder adaptations to the exercises taken place in the interventions. Also, because the exercises were water-based, the participants were in control of the intensity of their own movements.

The results of participant 2 show a high score in the RAPS at the beginning of the study. The RAPS scores were highest during the first weeks of the A1, although the highest score for participant 2 in RAPS was 4.67 during B1 in the seventh day of the fourth week. During these weeks Participant 2 did engaged in gardening and yard work. After the highest score the participant reached the low score of 2.00 in the RAPS during the B2 phase. The participant said that although it was sometimes painful adapting to some of the exercises and the water resistance afterwards the participant would feel relaxed and less bothered by the pain. During the highest score in the RAPS the participant was also participating from some gardening work and brisk walks, which according to the CDC (2016) are considered to be moderate physical activity. The combination of both getting used to the water-based exercises and the other activities could have been the reason for the high score in RAPS. The RAPS scores kept decreasing during the following two phases which include the A2 and the B2. The participant had a clear understanding on how after the exercises the pain would not be something that stop the participant from other daily activities that otherwise would not be able to do. The participant told the researcher how after engaging from the water-based exercises in the intervention, participant 2 would feel with a lot more energy even during the weekends: “After an initial pain during the interventions, I feel great and with no physical limitations.” The ATPAS scores for Participant 2 were presenting a pattern since the beginning of the B1 phase in the fifth week. But during the entirety of the study the pattern kept increasing in scores showing the participants ATPAS was increasing while the RAPS kept decreasing.

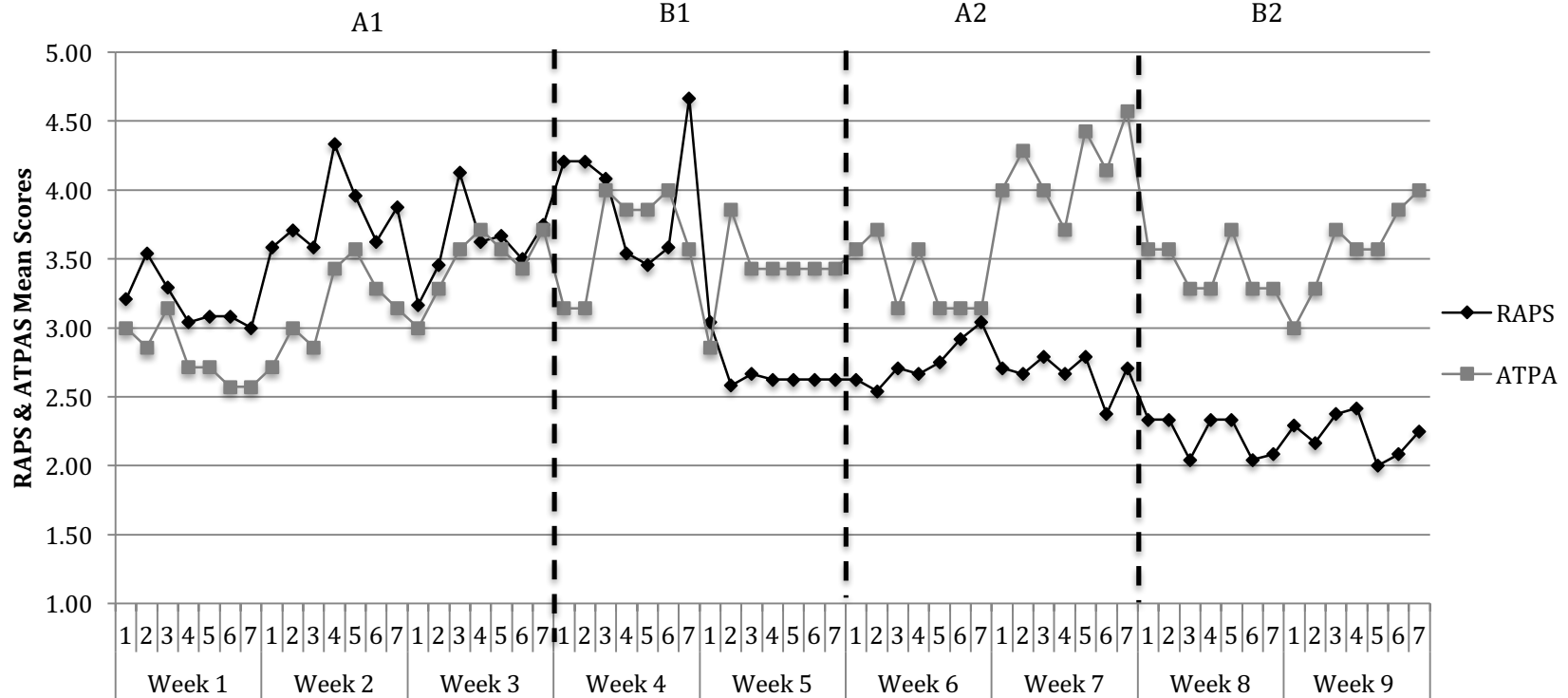
During the end of the study the participant was engaging in water-based exercises because of how the interventions made the participant feel and how the RA pain had significantly decrease. Nearing the end of the study the participant presented a mirror like effect on the RAPS and the ATPAS. A mirror like effect means that while the mean scores for RAPS was increasing the mean scores for ATPAS were

decreasing and the same happens the other way around, if the mean scores for RAPS decreased, the mean scores for ATPAS increased.

### **Research Questions**

For participant 2 the increased pain in RA brought low scores in ATPAS. Participant 2 mentioned during the study how the pain got in the way of doing some of the physical activities during the weekends. After starting the interventions, the participant stated that the exercises gave more energy and the RA pain did not prevented the participant from engaging in the physical activities over the weekend. Once the interventions started the participants scores for ATPAS started increasing as the RA pain decreased. From the intervention the participant was feeling less RA pain and increases in ATPAS with variability, mostly being caused by personal problems. The participant expressed wanting to continue the water-based exercises but not being able to after the interventions. The participant did continue to do moderate physical activity in the form of yard work.

**Figure 5.2** Mean Scores for Participant 2 in Rheumatoid Arthritis Pain Scale & Attitude Towards Physical Activity Scale



*Figure 5.2* During the A1 phase the mean scores for RAPS were high, while the ATPAS started increasing after the second week. During the B1 phase in the fifth week the scores for RAPS started a decrease which continued until the end of B2 phase. During the A2 phase in the seventh week there is a downtrend with variability in the mean scores for RAPS and an uptrend with variability for ATPAS mean scores. For ATPAS the scores increased with some variability all the way until the end of B2 phase.

### **Profile Participant 3**

Participant 3 is not physically active, although in the past, the participant used to engage in water-based activities such as water aerobics and Aqua-Zumba. Even though, it has been a long time since participant 3 had done any of these activities, the participant feels very comfortable doing water-based exercises. The CDC considers these activities that the participant used to engage in as moderate to vigorous physical activity. Participant 3 on a normal workday is sitting down and overall requires low physical activity. Sometimes the participant is required to go up and down the stairs but no physical activity that would go beyond moderate. The participant did not have a special diet or any type of restricted meals. Participant 3 is constantly in pain and has doctor-referred pills for Rheumatoid Arthritis but only are taken when pain is too much to tolerate.

Participant 3 also has other conditions besides RA that bring serious chronic pain, these could be the reasons why the RAPS score did not go lower than 3.13 during the entire study (See Figure 5.3). Also the participant scored a high 4.95 in the RAPS during two days in the B1 phase. Participant 3 showed a steady increase and decrease in RA pain, but overall was displaying a high score in RAPS during the first week of A1. During the second week of A1 there was an increase from day four to day five in ATPAS and a decrease in the RAPS from the first week to the second. Although during the third week of A1 the scores were high for RAPS, there was a decrease from 4.14 to 3.14 during the last day of the third week of A1 to the first day of B1. The RAPS scores kept being low score for the duration of the fourth week in the B1. The decrease in RAPS meant that the water-based exercise had a positive effect on the participant's RA pain. ATPAS also, presented a decrease during the first day of B1 from 4.14 to 3.00. The participant was not able to do all of the exercises required in the intervention to completion. Some modifications had to be done by the researcher and the physical activity experts, in order to



facilitate the exercises. This made the participant feel discouraged to do the physical activity, the participant even voiced the following: “. . . It feels like I can’t do the same things I used to do when I participated in Aqua-Zumba.” This was the reason the participant scored low in the ATPAS while at the same time presenting low scores in the RAPS. The first day of the fifth week the RAPS score increased from 3.21 to 4.95, this was due to the hard housework the participant did during the weekend and the starting of the exercises of the second week of B1. The participant was constantly using force by taking care of someone; some examples are things like heavy lifting, helping a person sit, stand or move. After the B1 day the participant mentioned trying to engage in some stretching exercises and some of the movements done during the water-based exercises during the mornings. “I do the stretches the days we don’t have the interventions, it has helped me a great deal with some of the heavy lifting chores in my house.” During the first week of B1, participant 3 scores went down for both the ATPAS and RAPS, as this decrease in pain for the participant was because of getting used to the water-based exercises again. This pain from getting used to the exercises again was decreasing the positive attitude in respects to physical activity in the participant.

In the second week of the B1 phase the RA pain scores increased once again, while the participant’s ATPAS scores kept low as it did before during the first week of the B1. The participant mentioned: “while doing some gardening work and harvesting coffee I started experiencing some really strong RA pain.” After the B1, the RA pain scores decreased while the scores for ATPAS increased. It is worth noting that participants’ RA pain scores never went below the mean score of 3.13 during the B1 phase. After the first time engaging with the water-based exercises the participant presented an increase in pain and was at first not feeling positive in respects to participating in physical activities. After the B1 phase the participant began a steady downtrend for the entirety of the study in RA pain. After the participant ended the first water-base exercises phase the participant started getting accustomed to the

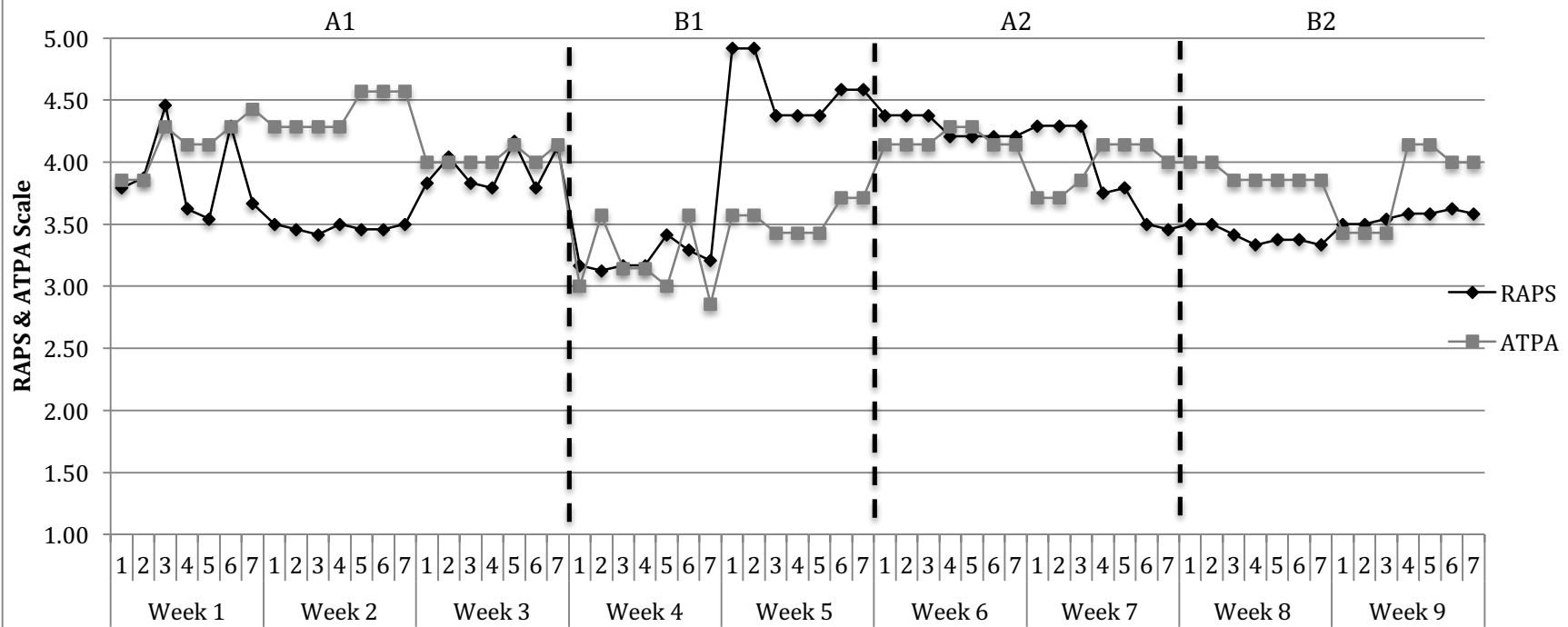
interventions and even though the pain did not decrease below 3.13 the participants positive attitude in respects to physical activity increased. During the first encounter with the water-based exercises the participant presented the lowest scores in RA pain. Participant 3 was experiencing pain during the entire study but reached the lowest RA pain during the interventions, more specific during the B1 phase.

### **Research Questions**

Rheumatoid Arthritis pain limited the participant's movements and daily activities, especially during the weekend where the participant would do household work. During week two the participant was feeling presenting high scores on ATPAS and low RAPS scores, which meant the pain was not as bad during these days. When the weekend of the third week started the participant had more RA pain that lower the participants ATPAS scores. Participant 3 mentioned having gone to the doctor during the A1 phase and having started new medication for the RA pain. In the B1 there was less pain for the remainder of week four, this decrease in pain was due to the exercises as the participant said: “. . . during the exercises I feel so light that I forget about the pain caused by my RA condition . . .” After participating from the first water-based exercises in the B1 phase, RA pain increased. This increase in RA pain brought the participant lower scores in ATPAS. During this B1 phase the participant was not inclined or did not wanted to do any other type of physical activity, showing more pain and problems during the common activities. After the increase in score for RAPS in B1 phase, there was a downtrend for RAPS and an uptrend for ATPAS for the rest of the study. The participant got accustomed to the water-based exercises once more. Participant 3 mentioned wanting to continue with the water-based exercises after the study was done. Even to the point of wanting to get together with the same participants in the pool. After the B2 phase was finished the participant was making the effort to engage once more in water-based exercises.

After the participant engaged in the first week of B1's water-based exercises, the RA pain increased significantly. Participant 3 was in constant pain and getting used to the water-based exercises took the participant the rest of the study. Participant 3 commenced a downtrend in RA pain after this initial increase in the B1 phase. This meant that the participant was experiencing less RA pain as a benefit from the interventions but after a few days of starting them. The participant knew this would take time to get used to again as the participant had past experiences in water-based exercises as is stated by the Self-Efficacy theory. The participant wanted to continue the water-based exercises as the participants knew from past experiences that after the initial increase in RA pain came the benefits. Besides the decrease in RA pain there was also some extra benefits; like relaxation, which the participant experienced. This made the Perceived Benefits and past experiences of the participant to decide to continue engaging in the interventions no matter the motivation or RA pain.

**Figure 5.3** Mean Scores for Participant 3 in  
Rheumatoid Arthritis Pain Scale & Attitude Towards Physical Activity Scale



*Figure 5.3* During the A1 phase participant 3 presented high scores for ATPAS reaching the 4.57 score, but presenting high scores for RAPS as well. Both the ATPAS and RAPS reach a similar high score during the third week of A1. At the start of B1 there was a decrease in mean scores for both ATPAS and RAPS. After week five there is a relative same mean score for both the ATPAS and RAPS which continued right until the end of the B2 phase.

### **Profile Participant 4**

Participant 4 is not physically active, mostly because the RA condition becomes painful at the moment of trying to exercise. There were times where this participant did not showed RA pain, in those situations participant 4 engaged in brisk walks. Although sometimes the brisk walks helped the participant, at the end of the activities the RA pain would increase: “Right at the end of my walks around the neighborhood the RA pain starts acting up again.” Rheumatoid Arthritis pain normally affected the participant’s hands, fingers, hips, and during these brisk walks the knees were affected. These pains sometimes limited the participant’s rest time and the willingness to engage in physical activity. Even after doing the brisk walks the participant felt RA pain affected in a negative way the participant’s behavior in respects to physical activity.

In the field notes taken during the first day of B1 phases, participant 4 was in need of assistance to get in the pool. Around the fifth week of the study during the second part of the B1 phase participant 4 was getting in the pool without help from the chair lift or the physical activity expert. During the A1 phase participant 4 had an increase in RAPS a score from 3.25 to 4.70 (See Figure 5.4). The RA pain scores kept in a general high score until the fourth week in the B1 phase. During this fourth week of the B1 phase the scores were low from what they were during the A1 phase, the scores dropped to 2.00 in the RAPS. “. . . I started walking around my neighborhood again and this time the pain is not there while I walk . . .” The participant felt stronger during the first week of B1 phase. The RA pain in participant’s hands did not affect the motion in the hands and fingers while doing the intervention. During the fifth week of the B1 phase the participant was showing high scores in RAPS reaching 3.96 in the third and fourth day. Different from what was showed in the fourth week of B1, the fifth week the participant was experiencing more RA pain. The scores for RAPS went as high as 4.08 during the fifth

week of B1. After the exercises in the fourth week of B1 phase the participant was feeling very energetic and without pain, to the point where the participant decided to engage in walks during the days. While in the fourth week the participant was feeling energetic and without pain, after the first intervention exercises, so decided to walk during the days. These extra walks, which are not normal for participant 4, could be a possible reason for the high RA pain scores during the fifth week of B1. Generally people do not try to do something new unless they think they can do it (Jones & Bartlett, 2009). The participant added more exercises after the B1 phase, because of the benefits the water-based exercises brought. After the water-based exercises participant 4 did not feel physical limitations in the brisk walks like before. Self-efficacy plays a more prominent role in the prediction of exercise behavior in the early adoption and adaptation stages of the programs, but less in the maintenance portion (McAuley & Blissmer, 2000).

During the A1 the overall score for the ATPAS was high, ranging from the 2.71 to 4.29. The RAPS scores were also high during the A1 phase, and during the fourth week of B1 participant 4 presented positive changes in respects to physical activity. Participant 4 presented less pain from RA and an increase in the scores for ATPAS during the first seven days of B1 phase. During the fifth week of the B1 phase participant 4 presented high scores in the RAPS, but at the same time presenting low scores in the ATPAS. Participant 4 was feeling pain during the last days of the first intervention, getting used to the exercises was not easy at first for the participant. These increases in pain scores during the fifth week of B1 phase were due to the soreness of the intervention exercises and the brisk walks the participant added to the daily routine. Participant 4 presented the lowest scores from RA pain in the nine weeks of the study after the sore muscles got better during the A2 phase. The RAPS scores for the A2 decreased from 4.08 in the last day of B1 to a 2.46 in the first day of the sixth week. At this time participant 4 presented high scores reaching 4.43 in ATPAS. Participant 4 mentioned feeling a decrease in RA pain after the B1 was completed. This participant felt less pain after engaging in the water-based

exercises, making the connection of the interventions and less pain the participant decided to do other physical activity. The water-based exercises offered the participant a decrease in RA pain that other physical activities the participant had engaged before did not. Besides these decrease it also made the participant engage in more physical activities which means the participants ATPAS increased during B1.

In the B2 phase the participant showed a decrease in RA pain at the start of the intervention followed by an increase to 3.79, the same pattern as in the B1 phase although, the increase in RA pain this time did not reach 4.08. A difference was the fact that even though the pattern was present, the RAPS scores did not go higher than 3.79 and went low as 2.38 the first day of week eight. At the same time participant 4 showed high scores in the ATPAS, with a small decrease also occurring in the ninth week of B2. This time even though participant 4 was feeling RA pain it was not having a negative effect on the participants rest or limiting from doing physical activity. Participant 4 voiced the following: “I have started walking around again this time with no pain and I really want to continue this pattern of physical activity.” Participant 4 told the researcher during the interventions that days after doing the exercises the muscles would feel stronger and overall with more energy. During this week the participants result showed an uptrend in RAPS score that explain the reasons for decreases and variability in the ATPAS during the B2 phase.

This participant was having a positive attitude in respects to physical activity even though having an increasing RA pain during the entire B2 phase. The RA pain for this participant never reached the high scores it did once before during the A1 phase. Even though RA increased it never went as high in the scores as before the interventions. After the B1 phase the participant presented and expressed a decrease in RA pain, which made the participant increase the ATPAS. Even with a steady uptrend in RA pain the decrease in RA pain from the water-based exercises made the participant want to engage in more physical activities [brisk walks]. The water-based exercises helped the participant feel more

encourage doing new physical activities, so the participant engaged in conversations with other participants. The talking points of these conversations were about past experiences exercising with RA, diets and foods. The participants would also talk about recommendations and suggestions to deal with RA. Some recommendations were about how or where to do water-based exercises. Participant 4 was always looking for adaptations that could be added to the water-based exercises, which made it more challenging. As the Self Efficacy theory states, the participant will look at past attempts in order to make a decision whether to adopt a new behavior. Past experience adopting a new behavior, their experience in life with the process of adopting a new behavior (it can be an experience with someone they know), how persuaded they are by the people in their environment and by their own psychological state (Jones & Bartlett, 2009). Participant 4 had problems with the brisk walks before the water-based exercises, but after the B1 phase the participant was already doing the walks again. The Health Belief theory states that the participants behavioral change is directly affected by the persons Perceived Barriers. At the same time as the Health Believe theory states the participants adoption of a new behavior can be affected by the perceived seriousness. “. . . I have seen how participant 3’s condition limits her mobility sometimes and I know that is starting to happen to me . . .” The person’s knowledge is often based on medical information, but it may also come from the beliefs a person has about the difficulties the disease can bring to their life in general (Jones & Bartlett, 2009).

### **Research Questions**

Participant 4 had RA pain that limited the ability to do physical activities. This participant voiced the following: “. . . during the mornings the pain in my fingers and bones make it difficult for me to get up . . .” During the interview the participant mentioned the following: “I have been doing some brisk walks now and then, but the pain has made me stop or shortened the distances of my walks.” Participant 4 was presenting RA pain before the study began and before the water-based exercises this participant

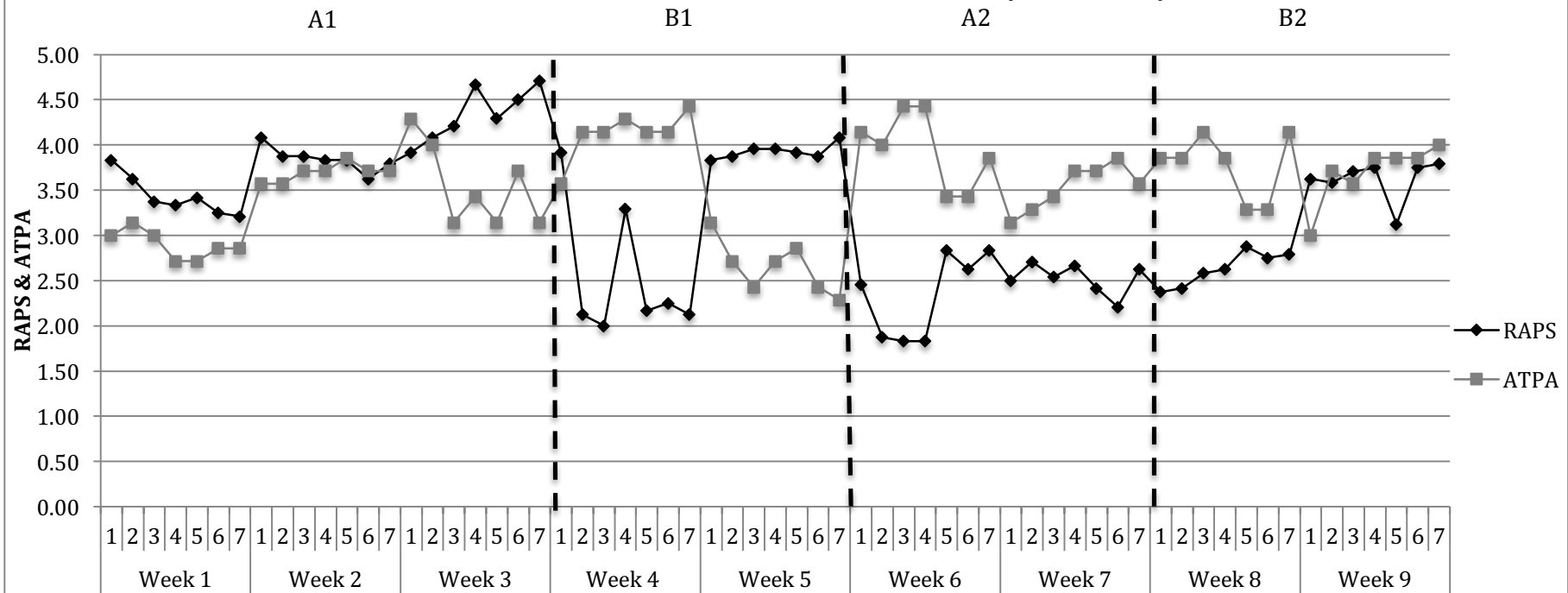


presented physical activity limitations. During the B1 the RA pain decreased during the first time of the water-based exercises. It was during this phase that the participant was presenting an increase in ATPAS. During the fifth week of the B1 the mean scores for RAPS increased drastically, this due to the participant adding brisk walks and getting used to the interventions. The participant decided to add the brisk walks because of how positive the participant was feeling after the water-based exercises in week four. The RA pain caused the participant had to stop doing the brisk walks after the fourth week in B1. During the B2 the participant's RAPS scores started low but began an uptrend with variability until the end of the phase. One of the differences between the B1 and the B2 phases was that in both interventions the participants RAPS score increased but in the B2 the ATPAS did not decreased as a consequence. In the B2 phase participant 4 continued again with the brisk walks and although the RA pain increased it did not stop the participant from the activity. Participant 4 was very vocal in wanting to continue with the water-based exercises after the study ended. During the A1 phase the participant was able to notice the positive effect of water-based exercises and how the Perceived Benefits were more reachable than though before. The participant decided to stop the brisk walks in order to swap them with water-based exercises. The participant mentioned: "I started going to my daughter's pool and doing the same exercises you showed us." The added benefits of water-based exercises on RA participants over other more impact exercises were presented to each of the participants. Water provides buoyancy, which help support the joints, making it easier to move around freely (Arthritis Today, 2013).

The graphs presented that if the RA is worse you get more variability in all of the participants, suggesting that the more controlled the RA condition the less variability in RA pain will be present. This pattern presented in the graphs also could mean that the participants were more open to do physical activities. Although some participants presented increases in RA pain and still maintain or had a positive attitude in respects to physical activity and the water-based exercises. Generally people do not try to do

something new unless they think they can do it (Jones & Bartlett, 2009). During and after the B1 phase all four participants were feeling capable of doing any physical activities without any limitations produced by the RA condition. Even though RA pain was still present and sometimes in the high scores for some participants, their attitude in respects to physical activity, probability for a positive behavioral change, was not affected at times of executing activities that before the interventions would had probability been limited by RA pain.

**Figure 5.4** Mean Scores for Participant 4 in Rheumatoid Arthritis Pain Scale and Attitude Towards Physical Activity Scale



*Figure 5.4* During the A1 phase the participant presented an uptrend in both the ATPAS and RAPS, until the third week. During this week is where an inversely proportional relation between the mean scores in ATPAS and RAPS begins. In the B1 phase the participant starts the intervention phase with high scores for ATPAS and low scores for RAPS, after the fourth week the scores changed, with an increase in RAPS and a decrease in ATPAS. Important to notice how in both B1 and B2 the participant had decreases at the beginning of week 4 and week 8 in the RAPS.

## Conclusion

There was a positive change in each of the participant's attitude in respects to physical activity after having participated from water-based exercises even when the scores for RAPS were high with some of participants results. Non-pharmacological care like physical activity will help the patient with RA to cope with the chronic pain and disabilities or physical limitations through the design of programs that work on flexibility, endurance, strength, bone integrity, coordination, balance, and risk of falls (Iversen, Chhabriya & Shadick, 2011). Every participant was interested in continuing to exercise in the pool after the first water-based exercises and after study was over, even participants who were already exercising. Some of the participants started exercising [not water-based exercises] on their own because of how the interventions made them feel. After the B1 the participants felt like they could do the physical activities they normally did without any limitations. Participant 4 continued with the brisk walks and engaged in water-based exercises some times.

Participant 4 started walking around the neighborhood in order to exercise more during the weeks of intervention, when there were no water-based exercises. Besides offering support to the joints water makes a unique resistance for muscles, making them stronger and healthier (Arthritis Today, 2013). Participant 2 and participant 4 had similar proportionally inverse relationship between the ATPAS and the RAPS. For these two participants, whenever the RAPS increased their ATPAS decreased and vice versa. Rheumatoid Arthritis is a disease that will make it difficult for the diagnosed person to exercise, water-based exercise offers the participants a safe, low impact way to engage in physical activities (Koehn, Palmer & Esdaile, 2002). The water-based exercises did not only bring some RA Pain relieve but it also offers the participants

with RA a stress free moment and relaxation. These moments of relaxation and no stress are healthy for the mind as well as for the body. Having other people around each other with the same conditions and seeing how they deal with it and how they continue to live with the RA condition helped each other. The four participants felt stronger and with more energy after doing the interventions regardless of how the RAPS mean scores increased. Because even though they had RA pain their muscles had strengthen more than before, this explains why participant 4 could engage in the brisk walks even with pain. There was a common result for all four participants at some point of the study, which was an increase in RA pain without having a decrease in the ATPAS. This meant that the water-based exercises benefits go beyond what RA pain can make the participant experience. The Perceived Barriers defeat the Perceived Barriers thanks to the water-based exercises effect on the participants.

Having the study done in a grouped environment provided the participants with a comfortable kind of support group. This support group brought help for the participants with RA and their continuing conditions, by introducing them to a more beneficial type of exercise (water-based exercise). The water- based exercise offered the participants a better rest, stronger muscles even though they had an increase in RA pain. Regardless of this pain, they did the exercises resulting in a positive change in attitude in respects to physical activity. The participants were sharing experiences and advises that they each have learned and used effectively, or any other type of past experience. The interventions became a moment where the participants did not have to think about work or any other problems they had at that moment. The participants even thought of it as a type of therapy for their entire body and mind. Participant 3 said: “ It’s like therapy for us, at the end of the day, it’s great.” The participants were able to rest more, felt with more energy and were able to do things they could not before, or do the same

things they commonly did without RA pain limiting them. The results indicate that the benefits derived from both land- and water-based exercises are very similar. The prescription of land-based exercises is feasible, especially when hydrotherapy is not possible or contraindicated.

The results indicate that water-based exercises provide the RA participants with benefits that go beyond just decreases in RA pain, while at the same time increasing the ATPAS scores. Water-based exercises had a direct effect on the participant's self-efficacy and health belief, increasing the participant's willingness to engage in physical activity, or create a positive behavioral change in respects to physical activity. There is an added beneficial factor offered by water-based exercises that other exercises out of the water do not provide. With more time in the study the assumption could be made that the participants would continue to strive for a more positive behavior in respects to physical activity. Furthermore, the results of this study provided information on psychological and social support the participants engaged in during the interventions. There was a positive change in behavior in respects to physical activity after the participants engaged in the water-based exercises, even if those positive changes did not always include decreases in RA pain. Future research focusing on the effects of warm water-based exercises and a RA support group can be valuable for RA patients.

### *Implications of Practice*

After the study results the following suggestions should be considered when engaging RA participants with water-based exercises:

- a) The water-based exercises should be done in pairs, having the RA participants working out not just together but with each other. This would also benefit the water resistance, as the pairing of the participants would adjust the resistance to what they want.
- b) During the interventions relaxation music can be added, this can bring also some more motivation for the participants to do the water-based exercises.

### *Recommendations for future research*

The following recommendations for investigating behavioral changes in participants with Rheumatoid Arthritis through a water-based exercise program should be considered after the study's results. A replication of the study is proposed but utilizing warm water temperature, as warm water could provide a more comfortable environment for the RA participants to exercise. There is need for investigating on the interventions as a type of support group for participants with Rheumatoid Arthritis condition. There is need measure the psychological and social stress levels of the participants during the baseline and intervention phase. More information regarding the stress levels for the RA pain and the attitude in respects to physical activity with RA patients. Water-based training programs designed specifically for the RA participants. Introducing more participants with Rheumatoid Arthritis. Some of the most relaxing things about the interventions for the participants is the interaction with people who are dealing with the same RA condition. The prescription of land-based exercises is feasible, especially when hydrotherapy is not possible or contraindicated (Nolte, Janse van Rensburg & Krüger, 2011). In future studies there is need to design a program which incorporates out of the water exercises after some water-based exercises,

in order to offer the participant with RA more choices.

For future study adding warm water to the interventions would be beneficial for the participants. In this study the water was at a natural temperature, which made it hard for the participants to get in the first time and to get used to the temperature. Expand more on what each participant said about the interventions feeling like support group meetings for RA patients. Increasing the length of the intervention can offer more information on each participant's behavioral change. The combination of the water-based exercise program and the stress free environment showed to be beneficial and demonstrated a positive change in the participant's attitude in respects to physical activity despite of the increases of RA pain.



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## Appendix A



**Institutional Review Board**  
**CPSHI/IRB 00002053**  
 University of Puerto Rico – Mayagüez Campus  
 Dean of Academic Affairs  
 Call Box 9000  
 Mayagüez, PR 00681-9000



December 5, 2014

Juan Neco Valle  
 Physical Education  
 Arts and Sciences  
 University of Puerto Rico at Mayagüez  
 Call Box 9000  
 Mayagüez, PR 00681-9000

Dear Juan Neco Valle:

The IRB has reviewed your application for the project *The effects on behavioural change towards physical activity in participants with Rheumatoid Arthritis, through water based physical activities* (Protocol no. 20140414).

We appreciate your responses clarifying our concerns. All materials submitted were evaluated and discussed and the IRB has determined to grant approval of your project effective today and expiring on December 4, 2015. If you project will extend beyond this date, we ask that you submit an application of extension no later than one month before your approval expires. A brief report summarizing activities and findings must be submitted by that period.

Modification and amendments to the approved protocol must be reviewed and approved by the IRB before they are implemented. The IRB must be immediately notified if any complaints, either from the subjects or the study staff, are made regarding the research study. The IRB must be likewise immediately informed if any breach of confidentiality occurs.

We appreciate your commitment to uphold the highest standards of human research protections and remain,

Sincerely,

Aidsa I. Santiago Román  
 Chair, Institutional Review Board (IRB)  
 University of Puerto Rico,  
 Mayagüez Campus  
 Office: Celis 108  
 Tel.: (787) 832-4040 Ext. 6277  
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**Email:** [cpshi@uprm.edu](mailto:cpshi@uprm.edu)

## Appendix B

UNIVERSITY OF PUERTO RICO  
MAYAGUEZ CAMPUS  
COLLEGE OF ARTS AND SCIENCES  
DEPARTMENT OF KINESIOLOGY

### **Letter of consent**

Dear participant:

I am a graduate student in the Masters of Arts in Kinesiology program under the direction of Dr. Carlos E. Quiñones Padovani in the Department of Physical Education at the University of Puerto Rico at Mayaguez Campus. I am conducting a research study to investigate the effects on behavioral change in respects to physical activity in participants with Rheumatoid Arthritis, through water-based physical activities.

Your participation will involve entering a pool and engage in various guided exercises and filling out survey questions. These water-based physical activities include: walking laterally, arm swings, squats, sponge squeezing, and jumping jacks. All of the above exercises will be performed inside the water with a personal physical activity expert to guide you. The water-based physical activities will be performed in a group of three other participants. The study has an expected duration of two months with two phases of filling out the questionnaires and two other phases of water-based physical activities three days a week for 45 minutes including warm up and stretching. Several American Red Cross certified lifeguards will be present at each one of the water-based exercise sessions.

Your participation in the study is completely voluntary, so if at any given time you decide to not participate or stop participating in the study you are free to do so without any penalty. All the information obtained from the study will remain confidential

to the extent allowed by law. The results of the study may be published but your name and information will not be disclosed.

The data collection consists of answering surveys daily. They will be collected daily and will not be taken home by the researcher for analyzing. This data will be collected and kept in a locked archive in Dr. Carlos E. Quiñones Padovani's office. The office is located at the Professors Office Building office 119. The only people allowed to view the information are Juan C. Neco Valle and Dr. Carlos E. Quiñones Padovani. All of the participants will remain confidential for the entirety of the study. Participants can have access to their own answered surveys at any time during and after the study. All of the information will be destroyed on or before May 20, 2016.

The benefit of your participation is to learn what effects water-based physical activities have in the behavior or attitude in respects to physical activity on a person with Rheumatoid Arthritis. The risks of this study will be moderately above minimum risk. Participants will be covered by the University insurance policy. His or her own personal physical activity expert will guide each participant and there will be an American Red Cross certified lifeguard at the pool at all times. If any further questions concerning the study or your participation in the study, please contact Juan C. Neco Valle at (787) 433-9796 or Dr. Carlos E. Quiñones Padovani at (787) 457-0166 or 787-832-4040 (ex. 6118).

Sincerely,

Juan C. Neco Valle

I, \_\_\_\_\_, give consent to participate in the above study.

Participant Signature \_\_\_\_\_ Date \_\_\_\_\_

Researcher Signature \_\_\_\_\_ Date \_\_\_\_\_

## Appendix C

UNIVERSITY OF PUERTO RICO  
MAYAGUEZ CAMPUS  
COLLEGE OF ARTS AND SCIENCES  
DEPARTMENT OF KINESIOLOGY

## Letter of Commitment

Dear physical activity expert:

I am a graduate student under the direction of Dr. Carlos E. Quiñones Padovani in the department of physical education and Kinesiology at the University of Puerto Rico at Mayaguez Campus. I will be conducting a research study to investigate the effects on behavioral change in respects to physical activity in participants with Rheumatoid Arthritis, through water-based physical activities.

Your participation as a physical activity aid specialist in the study is important as you play a role of security and guidance to the participants. If interested in participating on helping in the study, your responsibilities will include guiding and assisting the participants into and out of the water and helping in performing the range of motion exercises guiding the participants' movement when necessary. Each of the sessions includes the warm up and stretching at the end for a total of 45 minutes. As part of the responsibilities it is essential to have proper swimming clothes and to follow all of the Natatorium established rules. Sincerely, Juan C. Ñeco Valle

I, \_\_\_\_\_, have read and understood all of the responsibilities to be a physical activity specialist aid in this study and will make the commitment to follow them.

Participant Signature \_\_\_\_\_ Date \_\_\_\_\_

Researcher Signature \_\_\_\_\_ Date \_\_\_\_\_

Appendix D  
 UNIVERSITY OF PUERTO RICO  
 MAYAGUEZ CAMPUS  
 COLLEGE OF ARTS AND SCIENCES  
 DEPARTMENT OF KINESIOLOGY

Attitude Towards Physical Activity Scale

Semana \_\_\_\_Dia

Las siguientes preguntas son acerca del artritis y de su actitud hacia la actividad física. Favor marcar del 1(muy inseguro) a 5 (Muy seguro) para describir como te has sentido durante el día.

Muy inseguro		Muy seguro
1	2	3
4	5	
1. ¿Cuan seguro estas de poder controlar tu dolor?		_____
2. ¿Cuan seguro estas de que puedes continuar con tus actividades del diario vivir?		_____
3. ¿Cuan seguro estas de que puedes reducir tu dolor de artritis sin el uso de más medicamentos?		_____
4. ¿Cuan seguro estas de evitar que el dolor de artritis interfiera con tu descanso?		_____
5. ¿Cuan seguro estas en participar de actividad física (AF)?		_____
6. ¿Cuan seguro estas en participar de AF con otras personas?		_____
7. ¿Cuan seguro estas del uso de AF para una vida saludable?		_____

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Appendix E  
UNIVERSITY OF PUERTO RICO  
MAYAGUEZ CAMPUS  
COLLEGE OF ARTS AND SCIENCES  
DEPARTMENT OF KINESIOLOGY

Rheumatoid Arthritis Pain Scale  
(RAPS)

Semana \_\_\_\_\_ Dia \_\_\_\_\_

Las siguientes 24 preguntas están relacionadas al dolor y al artritis. Para cada una, escoge un número del 1 (nunca) al 5 (siempre) para describir como te has sentido durante el día.

- |  | 1     | 2 | 3 | 4 | 5       |
|--|-------|---|---|---|---------|
|  | Nunca |   |   |   | Siempre |
| 1. ¿Describirías tu dolor como una mordida?  |       |   |   |   | _____   |
| 2. ¿Describirías tu dolor como ardiente?   |       |   |   |   | _____   |
| 3. ¿Usarías la palabra desgastador para describir tu dolor?                                  |       |   |   |   | _____   |
| 4. ¿Describirías tu dolor como uno constante?  |       |   |   |   | _____   |
| 5. ¿Describirías tu dolor como uno molesto?  |       |   |   |   | _____   |
| 6. ¿Describirías tu dolor como uno intermitente (va y viene)?                                |       |   |   |   | _____   |
| 7. ¿Inflamación en al menos una de sus articulaciones?                                       |       |   |   |   | _____   |
| 8. ¿Siente dolor por la mañana de una hora o más? “Morning stiffness”                        |       |   |   |   | _____   |
| 9. ¿Siente dolor al moverse en por lo menos una articulación?                                |       |   |   |   | _____   |
| 10. ¿El dolor no le deja hacer todas las actividades del diario vivir que normalmente haría? |       |   |   |   | _____   |
| 11. ¿El dolor interfiere con el sueño y descanso?  |       |   |   |   | _____   |
| 12. La única forma para aliviar el dolor es con el uso de medicamentos adicionales.          |       |   |   |   | _____   |
| 13. ¿Describirías su dolor como de quemar?   |       |   |   |   | _____   |
| 14. ¿Protege sus articulaciones mucho por los dolores?                                       |       |   |   |   | _____   |

15. ¿Se aguanta las articulaciones por el dolor? \_\_\_\_\_
16. ¿Describirías el dolor como palpitante? \_\_\_\_\_
17. ¿Describirías tu dolor como uno agudo? \_\_\_\_\_
18. ¿Diría que su dolor es severo? \_\_\_\_\_
19. ¿Siente rigidez en las articulaciones después de reposar? \_\_\_\_\_
20. ¿Sus articulaciones se sienten caliente? \_\_\_\_\_
21. ¿El dolor hace que se sienta ansioso (a)? \_\_\_\_\_
22. ¿Describiría su dolor como un hormigueo? \_\_\_\_\_
23. ¿Diría que su dolor es incontrolable? \_\_\_\_\_
24. ¿Diría que se siente indefenso (a) al controlar su dolor? \_\_\_\_\_

Circule un número que represente la severidad en como evaluaría su dolor:

[illegible]

Sacado de: Anderson, D., 2001. Development of an Instrument to MEasure Pain in Rheumatoid Arthritis: Rheumatoid Arthritis Pain Scale (RAPS)