An Aqua Therapy Program for an Individual with Fibromyalgia: An Evidence Based Protocol

Laura Bellinger, Brenna Cowling, Lisa DaFoe, and Melissa Obrecht

Saginaw Valley State University
Abstract

Fibromyalgia is a condition in which an individual has pain, fatigue and overall weakness. Aqua therapy is one approach to treatment that is believed to help alleviate these symptoms. The purpose of the program developed in this project is to alleviate symptoms of FM through the use of aqua therapy for the upper extremities. The program was developed by researching different types of treatments for individuals with FM to determine an effective aqua therapy approach. While numerous articles have been published regarding aqua therapy treatment for FM, most of these articles focused on aqua therapy programs for lower extremities. The evidence shows that aqua therapy exercises are beneficial in one hour sessions with durations ranging from 3 to 24 weeks long.
An Aqua Therapy Program for an Individual with Fibromyalgia: An Evidence Based Protocol

Fibromyalgia (FM) is a life-long chronic pain syndrome in which there is no known structural or inflammatory cause. It is currently estimated that 3.4% of American women and 0.5% of men live with from FM (Goldenberg, Burckhardt, & Crofford, 2004). Those who endure FM have symptoms including fatigue, pain, weakness, stiffness and sleep disorders. The severity of these symptoms can fluctuate over time (Chakrabarty & Zoorob, 2007; Staud, Vierck, Robinson, & Price, 2006), and lead to reduced physical activity and decreased quality of life (Tomas-Carus et al., 2002). Persons with FM often experience long-lasting pain, stiffness and fatigue that have a severe impact on everyday activities such as walking, and completion of tasks requiring use of the arms.

Research has examined the effectiveness of many traditional exercise treatments for FM, particularly aerobic training with walking or running and muscle strengthening (Goldenberg, Burckhardt & Crofford, 2004; Rossy et al., 1999). Aqua therapy is one approach to the treatment of FM that utilizes water exercise and swimming to improve physical and psychological well-being. It helps to rehabilitate gradually, strengthens muscles and the cardiovascular system, and improves flexibility (Clark, 1994). According to Clark, the buoyancy of water supports 70 to 80 percent of the body’s mass which assists participants in performing exercises easier.

In this project, the researchers will discuss evidence regarding the uses of aqua therapy programs for persons with FM, and develop an evidence based program for a client named A.S. A.S. is a 34 year old female who was diagnosed with FM in 2003. She complains of pain, stiffness and fatigue. She notes that she has participated in pain treatment but nothing has helped to alleviate her symptoms. An aqua therapy program may be one intervention that could help improve A.S.’s function and quality of life.
Clinical Problem

As FM has become accepted as a legitimate disease, an increasing number of people have been diagnosed with it. However, with few options available to help people living with FM find comfort and relief from their symptoms, additional research needs to be done to develop more effective treatments. The limited amount of research done to examine the effectiveness of aqua therapy as a treatment for FM has focused on the lower extremities (Altan, Bingol, Aykac, Koc & Yurtkuran, 2004, Assis et al., 2006; Tomas-Carus et al., 2007). However, according to Staud, Vierck, Robinson, and Price (2006), the upper extremities are the major source of pain in patients with FM.

Purpose of the Evidence-Based Practice Project

The purpose of this project is to propose an evidence-based protocol for an aquatics program for a client with FM experiencing symptoms of increased pain and fatigue, and decreased endurance, range of motion, and strength in the upper extremities. The proposed aquatics therapy program will help provide evidence-based information regarding the use of this type of program to alleviate symptoms of FM.

Research Questions

The research questions that will guide the development of this evidence based practice project are as follows:

1. Which components of aqua therapy have been shown to increase strength in the upper extremities of persons with FM?
2. What aspects of aqua therapy help to decrease overall pain in persons with FM?
3. What aspects of aqua therapy decrease the amount of stress on joints in upper extremities during exercise?
4. Does aqua therapy have an impact on fatigue? If so, what components of aqua therapy are most effective?

Definition of Terms

Fibromyalgia. A life-long disorder characterized by widespread pain in 11 of the 18 tender points of the muscles and soft tissues of joints (Jentoft et al., 2001).

Aqua therapy. A form of therapy that utilizes exercises in warm water to allow for greater ranges of motion, higher tolerance to activity, and decreases in pain (Como et al., 2002).

Strength. The ability of a person to apply and withstand force through the use of muscle contractions (Como et al., 2002).

Endurance. Having the ability to exert oneself during physical activity (Como et al., 2002).

Fatigue. Feeling weary or exhausted (Como et al., 2002).

Pain. A sensation that is unpleasant and has ranges from uncomfortable to unbearable. Pain is physical and emotional. Physical components of pain can be a result of nerve stimulation, with the brain interpreting the level of severity of the pain (Como et al., 2002).

Range of Motion. The degree to which a joint is able to be moved (Como et al., 2002).

Significance of the Evidence-Based Practice Project

As a potential outcome of participation in this evidence-based program, participants may experience a change in symptoms associated with FM such as pain, fatigue, poor range of motion, low upper extremity endurance and poor strength. Other possible benefits include increased overall feelings of wellbeing, and improved fitness levels. The outcomes of this evidenced-based program proposal will contribute to the existing body of knowledge regarding aqua therapy for persons with FM, particularly programs for persons who desire to participate in
shorter-term aqua therapy programs.

Review of the Literature

Based on published literature regarding aqua therapy, several factors were looked at in order to develop the aqua therapy program in this document. A review of the literature provided information regarding the benefits of exercise in water. As noted previously, while there has been research performed on the effects of aqua therapy on FM, the majority of the research has been focused on the lower extremities, rather than the upper extremities, which was the main complaint of the client for whom this program was designed. The literature shows that aqua therapy is beneficial in managing pain of the lower extremities, which suggests that this type of therapy may also be beneficial for the upper extremities as well. In this literature review, information regarding the benefits of exercise, as well as the effects of water on the symptoms of FM, will be discussed.

Benefits of Exercise

The results of numerous clinical trials have shown that many individuals with FM benefit from aerobic exercises and activities involving muscle strengthening. However, the results of a study by Rutledge et al. (2007) indicated that less than fifty percent of the people with FM surveyed reported that they were engaging in exercise using strength training or an aerobic workout for symptom management. Those who reported using exercise as a strategy for self-management of symptoms related to FM found the intervention to be helpful, and were more likely to be higher functioning.

Similarly, a review article by Goldenberg, Burckhardt and Crofford (2004) stated there was strong evidence for the positive effects of cardiovascular exercise on the symptoms of FM. One study in the Goldenberg review article noted improvements in fitness, tender point pain
thresholds, and global assessment ratings of patients who completed 20 weeks of high-intensity exercises. This indicates the importance of using an exercise program for individuals with FM; however, there are no guidelines as to what frequency and duration is most beneficial.

A study done by Busch (2003, as cited in Goldenberg et al., 2004) found significant improvements in an aerobic-training group compared to a control group in the areas of tender-point pain, self reported physical function, and self-efficacy for function. Rossy et al. (1999), in their meta-analytic review, even recommended that for optimal treatment of FM, the treatment plan should include some kind of exercise program. These studies show that exercise can be an effective way of managing the symptoms of FM.

Multiple studies have highlighted the effectiveness of several different approaches to using exercise to benefit patients with FM. One approach is aqua therapy exercises. Mannerkorp et al. (2002) conducted a follow-up study of twenty-six women with FM who participated in a six month, one-day-a-week aqua exercise program. Questionnaires were distributed to the participants at six and twenty-four-months post-program completion. The Fibromyalgia Impact Questionnaire (FIQ) was used to examine the severity of symptoms experienced by the participants, and the RAND Short-Form 36 (SF-36) questionnaire was used to explore the overall health status of the participants. Analysis of scores collected six months post intervention indicated that the participants experienced improvements in symptom severity, anxiety, and physical and social function compared to pre-test measurements. At twenty-four months post treatment, participants reported continued improvements in pain, fatigue, walking ability, and social function.

A study conducted by Tomas-Carus et al. (2007) investigated the effects of a twelve week aerobic and strength training program for the lower extremities. The program, which
involved thirty-five patients diagnosed with FM, was conducted in waist high warm water. At program completion, the researcher instructed the participants to discontinue all physical exercise for twelve weeks. The researchers found significant improvements in physical fitness, balance, and stair climbing at twelve weeks post-intervention. Furthermore, participants reported pain relief that was maintained throughout the detraining period. Thus, it appears that aqua therapy is an effective intervention for the symptoms of FM in the lower extremities.

*Characteristics of Water*

The biophysical properties in water provide consistent pressure to the entire submerged surface (Grosse, 2009). According to Assis et al. (2006), key properties of water that make this an especially effective approach for rehabilitation include “…buoyancy, hydrostatic pressure gradient, water viscosity, specific heat of water, and controlled temperature” (p. 58). In particular, these properties allow for reduced weight and stress on major joints (Grosse, 2009).

Clark (1994) stated that performing exercises in water rather on land can help improve a person’s strength, endurance and flexibility, since 70 to 80 percent of one’s body mass is supported by the water when standing chest high. Essentially, as the percentage of body mass under water is increased, the effects of gravity on the body are decreased. The less an object weighs, the easier it is to move. Thus, once a person is under water, he or she can move more easily (Grosse, 2009).

When moving in the water, the buoyancy can both facilitate movement and provide resistance to movement. The buoyancy of water opposes the forces of gravity, and can facilitate weak muscles in moving in ways that they would not be able to when out of the water. This property of water allows individuals to increase ROM. Furthermore, in aquatics programs, activities can be graded through the use of various floatation devices that may assist in the
completion of upward movements in the water (Peterson, 2001).

   Exercising in water is considered a low-impact form of aerobic exercise, because it allows individuals to exercise with decreased joint stress and more fluid movement. When exercising on land, gravity pulls on the body. However, this pull is reduced once the body is placed in water. This allows the participants to become virtually weightless in water, and perform exercises with greatly reduced pain (Baum, 1998; Grosse, 2009).

   The temperature of water can also have therapeutic benefits. According to Grosse (2009), when the temperature of the water is warm, the muscles become less tense and more relaxed. Warmer water temperatures decrease pain with movement, and increase ease of joint movement (Peterson, 2001). This can be beneficial for individuals with FM, who typically would not be able to experience movement without pain.

   According to a study conducted by Rutledge et al. (2007), aquatic therapy, while reported as a highly helpful way of coping with symptoms of FM, was used by only less 50 percent of fibromyalgia patients surveyed. The previously discussed research articles that have been conducted on aqua therapy and FM have focused on the lower extremities. However, the main complaint with people living with FM is pain stemming from the upper extremities. Treating the upper extremities can help alleviate pain associated with the rest of the body (Staud et al., 2006). Exercising in water has been shown to cause improvements in emotional aspects of quality of life (Assis et al., 2006). Other articles stated that further research needed to be done in the area of aqua therapy in the upper extremities.

   The literature provides information regarding the benefits of aqua therapy programs for people with FM. It suggests that physical improvement can be made, and pain can be reduced and managed, through exercise. It also suggests that aqua therapy programs can be beneficial for
increasing overall quality of life for those who participate. Therefore it is important to continue research regarding the effects of aqua therapy on the upper extremities in order to establish a basis for treatment that involves aqua therapy.

Method

Project Design

This project will outline an evidence-based aqua therapy program for a patient with FM. It will be based on the literature and evidence supporting the use of aqua therapy as a treatment for symptoms associated with FM, such as pain, weakness, fatigue, endurance and strength. Specifically, this project will describe an evidence-based assessment and treatment protocol for an aqua therapy program for clients with FM.

Participant

A.S. is a 34 year old female who was diagnosed with FM in 2003. Her major complaint is pain in her shoulders. However, she also experiences back pain. A.S. currently resides in a second floor apartment with her roommate and four cats. She is employed at local hospital, but frequently misses work due to her FM. A.S. stated that her activities of daily living (ADLs) are affected by her FM, and that she has difficulty doing her hair and taking baths.

A.S. noted that household activities are also difficult. The laundry room in her apartment complex is located downstairs and outside in another building, and she can only do laundry if someone else carries the laundry basket to the facility and back to the apartment. Cleaning the apartment is also a difficult task, and A.S. stated that her roommate cleans the apartment as long as A.S. takes care of her cats.

A.S. enjoys doing craft activities and gardening. She explained that she used to participate in softball, but since she has been diagnosed with FM she has not able to do that.
Mobility is also something that A.S. has had a difficult time with. She has difficulty getting in and out of her car. A.S. is trying to walk more frequently, and her goal is to go on four short walks a day.

A.S. has problems sleeping. She rates her sleeping pain at 7, and states that she requires multiple medications in order to sleep. However, even with the medications she still wakes frequently throughout the night. She would like to participate in an aqua therapy program to decrease pain levels and the amount of medication that she uses to control symptoms.

**Instrumentation**

Data was collected using a variety of tools, including the Fibromyalgia Impact Questionnaire (FIQ), range of motion (ROM) measurements, manual muscle testing (MMT), and the Pencil-Paper Wall Test. The Fibromyalgia Impact Questionnaire (FIQ) (see Appendix A) was used to gather information regarding A.S.’s overall functional level; the severity of her pain and fatigue; and the intensity of generalized FM-related symptoms. The FIQ has been used in many prior research studies examining the effects of specific interventions on FM-related functional deficits (Bennett, 2005). It is important to evaluate symptoms of fatigue, endurance, pain and strength in studies examining outcomes of therapy programs for persons with FM because, as explained by Mannerkorpi et al. (2002), FM is characterized by long-lasting and widespread pain, stiffness, and fatigue that typically has a great impact on everyday activities.

Range of motion (ROM) measurements was taken to assess the amount of movement (in degrees) in specific arm joints using a goniometer. A goniometer was used to take measurements of bilateral shoulder movements (flexion, extension, abduction and internal and external rotation) and elbow movements (flexion and extension movements). These movements were taken because as explained by Jentoft et al. (2001), stiffness is another symptom of FM.
Manual muscle testing was also used to assess the strength of major muscle groups required for completion of each of the shoulder and elbow movements stated previously. Another common symptom of FM is generalized muscle weakness (Gusi, Tomas-Carus, Hakkinen, Hakkinen & Ortega-Alonso, 2006). Manual muscle testing allows for the evaluation of the strength of a muscle group by determining how much therapist-applied resistance the muscle can contract against. Manual muscle testing follows a standardized procedure, and is commonly used in rehabilitation settings as a way of assessing muscle strength for functional activities (Killingsworth & Pedretti, 2006).

The Pencil-Paper Wall Test was used to measure upper extremity endurance levels (in seconds). To complete the test, the evaluator had A.S. sit in a chair that faced a wall, and hold a sheet of paper against the wall with a pencil, for as long as possible. A.S. was positioned so that her shoulders were positioned at 30 degrees of flexion, with her elbows at 90 degrees of flexion. The test was discontinued when the paper fell, or the pencil moved more than 1 cm. Muscle endurance time was recorded in seconds. The researchers were unable to locate any information regarding the reliability and validity of the Pencil-Paper Wall Test. However, it was previously utilized in a study by Jentoft et al. (2001) examining the effects of a pool-based exercise program on women with FM.

Procedures

Data collection. Range of motion testing revealed deficits in bilateral upper extremity (BUE) active range of motion (AROM). Manual muscle testing using the “break” test revealed lower than average scores for the shoulder and elbow which explains the weakness in her BUEs. A.S. could only withstand minimal to moderate resistance for all of the shoulder and elbow movements (see Appendix E).
A.S. reached 20 seconds on the Pencil Paper Wall Test for both right and left shoulders. She noted that the test was difficult, and her shoulders were “very tired” at the end of the test.

A.S. scored a 69.72 on the FIQ. The average score for persons with FM is a 50; those who are severely affected by the condition score an average of 70 (Bennett, 2005). This implies that A.S. is severely affected by the symptoms of her FM. (Please see Appendices E and F for scores obtained from the ROM, MMT, FIQ, and Pencil-Paper Wall Test).

**Intervention.** Based on the results of obtained from A.S.’s assessment, the researchers developed an aqua therapy program that focused on the upper extremities. A.S. demonstrated bilateral upper extremity weakness and limited ROM. The exercises used in this aqua therapy program were selected to improve A.S.’s strength, ROM, and endurance in her upper extremities and decrease pain.

The aqua therapy intervention designed by the researchers for clients such as A.S. was six weeks in duration. Participants were to meet for two, one-hour-long sessions each week. The protocol was consistent with other previously-researched aqua therapy programs of short duration (three to twenty-four weeks in duration, as described in Gowans & deHueck, 2007). As mentioned previously, Gowans and deHueck noted that, “all pool programs [for persons with FM] regardless of length, should be viewed as beneficial,” with improvements in physical functioning noted for participants in all studies of programs of varied lengths reviewed (Gowans & deHueck, p. 171). However, these researchers specifically noted that further research is necessary to determine the optimal length of time for aquatic therapy programs. This justifies the researchers’ choice of a six-week-long aqua therapy program.

The aqua therapy protocol developed for this aqua therapy program was based on information from the book, *Water Exercises for Fibromyalgia: The Gentle Way to Relax and*
Reduce Pain (Rosenstein, 2006). Exercises in the program involve whole-body movements, with particular attention paid to use of the upper extremities, as few prior research studies have examined aqua therapy programs focused on the arms. A standardized exercise plan was developed for use during each treatment session. See appendix B and C for the exercise plan, and illustrations of all the exercises included in the aqua therapy intervention.

All of the exercises are to be performed at a depth of 4 feet of water, maintained at approximately 84 degrees Fahrenheit. According to Assis et al. (2006), for an aquatic program to be therapeutic, the temperature of water should be 82-87 degrees Fahrenheit. Warm water should be used because warm water relaxes muscles and water cooler than that can be uncomfortable (Clark, 1994; Grosse, 2009). The chosen depth would ensure that participants would be shoulder deep in the water. Each aqua therapy session will begin with a 15-minute warm up, which includes exercises emphasizing flexibility and range of motion throughout the body, with a particular focus on the arms. These warm up exercises include walking with breaststroke arms, walking with rowing arms, walking with American crawling arms, shoulder flexibility 1-3, and elbow flexibility. These exercises will help warm up the muscles of the arms, chest, back, hips, legs and feet. Each session will end with a 15-minute cool down, which will include exercises similar to those used in the warm up.

The therapeutic exercise component of each session will last for 30 minutes. Exercises in this component will focus on strength training, aerobics, and stretching of all parts of the body, with continued focus on the arms. The treatment exercises include arms breaststroke and rowing, water jog, water run with breaststroke arms, water run with rowing arms, water run with American crawling arms, rocking horse with push-pull arms, arms across, straight arms down front, chest flys, chest press, and upper arm 1-3. These exercises will work on shoulder and
elbow flexion and extension, shoulder abduction and adduction, shoulder horizontal abduction and adduction, wrist flexion and extension, and wrist pronation and supination. These exercises focus on shoulder and arm movements with the use of aquatic equipment such as kick boards, water weights, and water gloves.

Discussion

The results of a meta-analysis conducted by Rossy et al. (1999) reviewing FM treatment interventions indicated that nonpharmacological treatments impact self-reported FM symptoms more than pharmacological treatments alone. Nonpharmacological treatments included in this Rossy et al. (1999) study were physically-based treatments, psychologically-based treatments, and combinations of both. There have been several studies conducted regarding aqua therapy programs for FM. However, these studies used varying protocols. A standard protocol has not been developed for aqua therapy programs for persons with FM.

A randomized controlled study conducted by Assis et al. (2006) examined the effects of a 15 week program involving running or walking in warm water verses performing these same exercises on land. This study by Assis et al. found the aqua program to be as effective as the land-based program regarding complaints of pain. Similar to Assis et al. the program discussed in this paper also uses the FIQ and the visual analog scale for pain for assessment, as well as the sixty minute treatment sessions and a controlled warm temperature for the water. In contrast, the study by Assis et al. included the use of other assessments not included in the developing program, was conducted for a longer duration of time than this program’s 6 weeks. A shorter program duration was chosen to see if a 6 week program was an adequate length of time to be effective as treatment.

Tomas-Carus et al. (2007) conducted a randomized controlled study examining the
effects of a 12 week exercise program conducted in waist high warm water on physical fitness on women with FM. It compared the immediate effects of the program to the longevity of these effects after the program had ended. It concluded there were positive effects in physical function, body pain, general health perception, social function, and role emotional problems among other areas immediately following treatment. However, the only improvements to last over a period of no treatment were body pain and role emotional problems. In contrast the developing program looks at affecting pain levels and overall fitness and health, in addition to fatigue, range of motion, endurance, and strength. The study by Tomas-Carus et al. (2007), like the developing program, uses the FIQ, a controlled temperature of water, and a sixty minute treatment session. In contrast, the study used a 12 week treatment period followed by a 12 week no treatment period. Again, the aqua therapy program was developed for 6 weeks to assess a shorter program’s effectiveness.

A study conducted by Gusi et al. (2006) evaluated the short term and long term effects of exercise in warm water on FM. Similar to the developing program, pain, strength, and health-related quality of life were areas assessed and targeted in treatment. The temperature of water was also controlled for and maintained at 91 degrees Fahrenheit, which is warmer than the temperature protocol for the developing program. In contrast to this study, which focused on the lower extremities, the developing study focused on the upper extremities because research shows that pain throughout the body experienced by persons with FM often stems from pain that begins in the upper extremities (Staud et al., 2006). Another difference between this study and the developing program is this study was conducted in waist high water and the developing program uses shoulder deep water. The program chose to use deeper water so that the upper extremities would be submerged during exercise.
Jentoft et al. (2001) conducted a pool versus land-based exercise study for women with FM. This study examined the effects of a pool exercise program versus a land-based program and the resulting effects on participants’ pain and physical function. This study, like the developing program, focused on physical fitness and pain levels, used 60 minute treatment sessions as well as used the FIQ as an assessment tool. In contrast, this study was 20 weeks in duration versus the developing program’s duration of six weeks. The study’s protocol included a warm-up, stretching, strengthening, and a cool down similar to the developing program. However, the study by Jentoft et al. (2001) also included relaxation training and body awareness, which are not included in the developing program’s protocol because there was no other research found to support the effectiveness of treating the targeted symptoms of pain, fatigue, endurance, range of motion and strength.

The implications of these other studies show that the use of warm water aqua therapy program is therapeutic, there are therapeutic effects on some of the symptoms of FM, and 60 minute treatment sessions are effective. The limitations of this program are potentially the shorter duration of treatments. Another limitation of this program is the lack of literature support regarding the focus of treatment on the upper extremities. Future research could examine different water temperatures or if focusing on the upper extremities is most beneficial. Further research could include lifestyle redesign and cognitive-behavioral adaptations as a part of aqua therapy programs.

Conclusions

Aqua therapy in warm water is commonly used as a treatment for the symptoms of FM. This paper provides information and guidelines for using aqua therapy as treatment for such symptoms. The program discussed in this paper varies from the current body of literature by
focusing on the upper extremities for symptom management. The major findings from the current body of literature support the use of aqua therapy in warm water, and the use of the FIQ as an assessment. Based on the research studies conducted, aqua therapy seems to be an effective treatment that can be used alone or in conjunction with other treatment modalities. Further research could be done in regards to an aqua therapy program for FM that focuses on the upper extremities.
Acknowledgement

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References


Aqua Therapy


Appendix A: Fibromyalgia Impact Questionnaire

The Fibromyalgia Impact Questionnaire / R. Bennett

Table 1.

The FIQ Directions and Questions

Directions: For questions 1 through 3, please circle the number that best describes how you did overall for the past week. If you don’t normally do something that is asked, cross the question out.

Question 1.

<table>
<thead>
<tr>
<th>Were you able to:</th>
<th>Always</th>
<th>Most</th>
<th>Occasionally</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do shopping?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Do laundry with washer and dryer?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Prepare meals?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Wash dishes/cooking utensils by hand?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Vacuum a rug?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Make beds?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Walk several blocks?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Visit friends or relatives?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Do yard work?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. Drive a car?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11. Climb stairs?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Question 2. Of the 7 days in the past week, how many days did you feel good?

0 1 2 3 4 5 6 7

Question 3. How many days last week did you miss work, including housework, because of fibromyalgia?

0 1 2 3 4 5 6 7

Directions: For the remaining items, mark the point on the line that best indicates how you felt overall for the past week.

Question 4. When you worked, how much did pain or other symptoms of your fibromyalgia interfere with your ability to do your work, including housework?

- No problem with work
- Great difficulty with work

Question 5. How bad has your pain been?

- No pain
- Very severe pain

Question 6. How tired have you been?

- No tiredness
- Very tired
Question 7. How have you felt when you get up in the morning?

Awake well rested

Awake very tired

Question 8. How bad has your stiffness been?

No stiffness

Very stiff

Question 9. How nervous or anxious have you felt?

Not anxious

Very anxious

Question 10. How depressed or blue have you felt?

Not depressed

Very depressed

indicates that most subjects can follow the written instructions accurately without any additional verbal instruction.

Scoring the FIQ (Table 1)
The FIQ is scored in such a way that a higher score indicates a greater impact of the syndrome on the person. Each of the 10 items has a maximum possible score of 10. Thus the maximum possible score is 100. The average fibromyalgia patient scores about 50; severely afflicted patients are usually 70 plus. The questionnaire is scored in the following manner:

1. The first item consists of 11 questions that make up a physical function scale. The 11 questions are scored and added to yield one physical impairment score. Each item is rated on a 4 point Likert type scale. Raw scores on each item can range from 0 (always) to 3 (never) - thus the highest total possible raw score is 33. Because some patients may not perform some of the tasks listed, they are given the option of deleting items from scoring. In order to obtain a valid summed score for questions 1 through 11, the scores for the items that the patient has rated are summed and divided by the number of items rated (e.g. if the patient completed only 9 items at a score of 2 for each, the final score would be 9 x 2/9 = 2). An average raw score between 0 and 3 is obtained in this manner.

2. Item 2 is scored inversely, so that a higher number indicates impairment (i.e., 0 = 7, 1 = 6, 2 = 5, 3 = 4, 4 = 3, 5 = 2, 6 = 1, and 7 = 0, etc.). Raw scores can range from 0 to 7.

3. Item 3 is scored directly (i.e., 7 = 7 and 0 = 0). Raw scores can range from 0 to 7.

4. Items 4 through 10 are scored in 10 increments. Raw scores can range from 0 to 10. If the patient marks the space between two vertical lines on any item, that item is given a score that includes 0.

5. Once the initial scoring has been completed, the resulting scores are subjected to a normalization procedure so that all scores are expressed in similar units. The range of normalized scores is 0 to 10, with 0 indicating no impairment and 10 indicating maximum impairment.

In order to maintain a maximum possible score of 100 it is necessary to employ an “equalization calculation” if a
Appendix B: Exercise Itinerary

Total length of treatment: 1 hour

Warm-up: 15 minutes
- Walking with breaststroke arms
- Walking with rowing arms
- Walking with American crawling arms
- Shoulder flexibility 1-3
- Elbows

Treatment Exercises: 30 minutes
- Arms breast stroke
- Arms, rowing
- Water jog
- Water run with breast stroke arms
- Water run with rowing arms
- Water run with American crawling arms
- Rocking horse with push-pull arms
- Arms across
- Straight arms down front
- Chest flys
- Chest press
- Upper arms 1-3

Cool Down: 15 minutes
- Walking with breaststroke arms
- Walking with rowing arms
- Walking with American crawling arms
- Shoulder flexibility 1-3
- Elbows
Appendix C: Exercise Descriptions

Descriptions of Water Exercises
Taken from the book Water Exercises for Fibromyalgia: The Gentle Way to Relax and Reduce Pain
By Ann A. Rosenstein

Walking with Breaststroke Arms

Stand in chest deep water. The starting position is with the elbows out to the side, hands close to the chest, and palms of the hands parallel to each other and close together. To do the exercise, walk a short distance back and forth or in a small circle. As you walk, you push your hands forward. Rotate the hands at the wrist so the palms face outward, then attempt to part the water in a breaststroke. The stroke is completed when your arms circle around and are brought back to the starting position. This water walk can be done with the assistance of a companion or you can stay close to the pool edge for balance. This walk warms the muscles of the arms, chest, back, hips, legs, and feet.

Figure 27: Walking with Breaststroke Arms, beginning

Walking with American Crawl Arms

Stand in chest deep water close enough to the pool wall for comfort and support. As you walk in a circle or the width of the pool, rotate the arms from the shoulders as if you are doing the American crawl swimming stroke. To start, the arms are extended out front with the palms facing down. As you walk, the right arm swings down from the shoulder and reaches as far back as is comfortable. Turn the palm up and bring the arm up out of the water and then, with the palm rotated down, the arm is returned to the water. As the right arm gets about halfway through its rotation, the left arm begins its cycle. This alternating circle pattern with the arms continues as you walk continuously in the same manner.

Figure 31: Walking with American Crawl Arms
Shoulder Flexibility One

Shoulder rolls are good for preventing a rounded back and maintaining good posture. Shoulder rolls loosen and lubricate the shoulder joint, help to release tension within the neck and shoulders, and help to maintain a full range of motion. Stand in chest deep water and lift the shoulders upwards, forward, and down four to six times. The movement is then reversed by rolling the shoulders back away from the ears and lowering them down as if to set them into pockets in the back. This exercise is also repeated four to six times. These movements should be made in smooth, continuous circular motions.

Figure 37: Shoulder Flexibility One, rolling forward

Figure 38: Shoulder Flexibility One, rolling backward

Shoulder Flexibility Two

This flexibility exercise concentrates on the anterior and posterior muscles of the shoulder. Stand in chest deep water, arm's length from the pool wall, with your arms alongside your body. Slowly raise your arms up in front as high as you can, keeping the palms up and in a cupped position. Then turn the palms down and lower the arms, pulling them back behind your body as far as possible.

Figure 39: Shoulder Flexibility Two

Shoulder Flexibility Three

This flexibility exercise concentrates on the medial muscle of the shoulder. Stand in chest deep water, arm's length from the pool wall, with your arms alongside your body. Starting with the arms at the sides of the body, lift the arms out to the side and then up as far as you can with the palms up. Then turning the palms down, return the arms to the sides of the body and repeat this motion six to eight times.

Figure 40: Shoulder Flexibility Three
Elbows

This flexibility exercise prepares the elbow joint for biceps and triceps moves. Stand in chest deep water in a neutral position with your arms at your sides and palms facing up. Bring the fingers of both hands up to the shoulders with the palms facing the body. Then turning the palms to face outward, move the arms back to a straight position. The elbows stay at the sides the whole time. This exercise should be repeated six to ten times.

Figure 58: Elbows
Aqua Therapy

Arms, Breast Stroke

Sitting or standing in chest deep water push your hands forward. Then rotate your hands at the wrist so your palms face outward and part the water as in a breast stroke. The stroke is completed when the arms circle around and are brought to the starting position. The movement should be repeated six to ten times. This flexibility exercise can be done while standing or while sitting on the pool steps, on a water board, or a noodle.

Figure 55: Arms, Breast Stroke, seated on a kick board

Arms, Rowing

Sit or stand in chest deep water with arms outstretched at the sides, just under the water surface. Bring the arms around in front, scooping the water with the palms of the hands and then fold the arms in at the elbows and the hands in at the wrist. Then pull the arms towards the chest. The fingers follow the line of the arms as the arms open up to go back to the original position. This flexibility exercise can be done while you are standing or while you sit on the pool steps, a noodle, or a water board. This rowing motion should be repeated for six to ten repetitions.

Figure 56: Arms, Rowing, seated on a kick board

Water Run with Breast Stroke Arms

Stand in chest deep water and run back and forth or in a small circle. At the same time bring your hands close to your chest with elbows out to the side and the palms of the hands close together. As you run or jog through the water, push your hands forward, rotating them at the wrist so the palms face outward and attempt to part the water in a breaststroke. The stroke is completed when the arms circle around and are brought back to the starting position. This aerobic exercise can be done with the assistance of a companion and you may want to stay close to the pool edge for balance. This Water Run is a more intense version of the Water Walk with Breast Stroke Arms. For a full aerobic effect, this exercise should alternate with other aerobic exercises such as the Water Run with Rowing Arms.

Figure 93: Water Run with Breast Stroke Arms

Water Run with Rowing Arms

Stand in chest deep water and run back and forth or in a small circle. Start with your arms outstretched at the sides and just under the water surface. As you run, the arms swing around to the front and scoop water with the palms of the hands and then the arms fold in at the elbows and the hands fold in at the wrist as the arms come towards the chest. Your fingers then follow the line of your arms as the arms open up to begin again. For a full aerobic effect, this exercise should alternate with other aerobic exercises for a period of at least 15 minutes.

Figure 94: Water Run with Rowing Arms
Water Run with American Crawl

Stand in chest deep water close enough to the pool wall for comfort and support. As you run or jog through the water, rotate the arms from the shoulders as if doing the American crawl swimming stroke. To start, the arms are extended out front with the palms facing down. As you run, the right arm swings down from the shoulder and reaches as far back as is comfortable. The palm is then turned up and the arm is brought up out of the water and then with the palm rotated down, the arm is returned to the water. The left arm makes the same kind of circle, starting when the right arm comes out of the water. The alternating circle pattern continues as you run or jog continuously.

Figure 95: Water Run with American Crawl Arms

Rocking Horse with Push-Pull Arms

Stand in waist to chest deep water a comfortable distance from the pool wall. Bring your left knee up to chest level and balance on the right foot. Bending the arms slightly at the elbows, bring the arms and hands up just under the surface of the water. The palms of the hands are up and in a cupped position. Then rock forward so the left foot is planted on the pool floor. As the left foot comes down, the right leg is brought up in back with a bent knee. Extend the arms with the hands open and flat so they can push the water down in front. Then step up with the right foot to where the left foot landed and raise the left knee again. Continue this rocking motion through the water or in a circle. After rocking about 30 feet, switch legs so the right leg is in front and the left leg rocks back. Switch which leg is in front every 30 feet or so. You may wish to use a long bar bell or water gloves for added resistance when pushing and pulling against the water.

Figure 96: Rocking Horse with Push-Pull Arms using a Barbell

The Water Jog

The Water Jog uses the large muscles of the legs. In waist to chest deep water, standing tall with a neutral spine, alternate lifting your leg up off the pool floor, bending at the knee, and kicking back the foot. You may want to stand arm’s length from the pool wall in case the ledge is needed for support. Standing in chest deep water offers more cushioning effect for the knee and hip joints compared to standing in waist deep water. The faster you alternate your feet, the more intense the exercise becomes. Another way for you to intensify the Water Jog is to move while jogging (from one side of the pool to the other, legs or in a circle). The movement causes a drag effect, which adds resistance to the exercise. If you are in chest deep water and are jogging at a good pace, drag will make the exercise more intense than in waist deep water.

Figure 91: The Water Jog

Arm Cross

This exercise helps improve balance and strengthens the arms, shoulders, chest, abdominal muscles, and upper back. Stand in chest to shoulder deep water, legs straight, feet shoulder width apart, with knees slightly bent. The arms are out to the side of the body and parallel to the pool surface. To protect the lower back, you should keep the gluteus under the pelvis. Bring your arms down from the shoulders keeping your hands cupped. Cross the arms at the wrists in front of your body at about waist height. Then lift the arms to the point of being parallel to the pool surface and bring them down from the shoulders, with hands cupped, and cross them at the wrists in back of your body, again about waist height. One crossing in front and one crossing in back equals one complete repetition. Start with one set of six to ten repetitions and then relax for a few seconds before doing another set. You should work towards three sets with ten repetitions in each set. Gloves, paddles, or weights may be used to increase resistance.

Figure 135: Arm Cross, front and back
**Aqua Therapy**

**Straight Arms Down Front**

This exercise helps with balance and strengthens the arms, shoulders, abdominals, and the upper back. Stand in chest to shoulder deep water with the feet shoulder width apart, knees soft, with the gluteus tucked under the pelvis. An aquatic barbell may be used for added resistance. If you feel unbalanced, you can stand with one foot behind and off to the side. This stance provides you with a wider base of support. Hold the barbell with the hands facing down, shoulder width apart. Start with the arms and barbell just under the surface of the water. Keeping the wrists straight and pulling from the shoulder, bring the barbell down to the thighs and then, slowly and with control, bring the arms and barbell back up to just under the surface of the water. If equipment is not used, you can cup the hands. Start with the arms out in front, parallel to each other and just under the surface of the water, and turn the palms down. Then pull the arms down to the thighs, keeping them parallel to each other. Then turn the palms up and bring the arms back to just under the surface of the water. One repetition is one up and down movement. Start with six to ten repetitions in a set working towards doing ten repetitions in each set for three sets, resting briefly between each set.

![Figure 136: Straight Arms Down Front, using a barbell](image)

**Chest Flys**

This exercise strengthens the muscles of the chest, abdominals, shoulders, and back and is done in the transverse plane. The muscles of the back and abdominals contract to help maintain balance and stability. Stand in chest to shoulder deep water with both arms in front, parallel to the pool floor and your hands held in a vertical position. Your feet are shoulder width apart and straight with a soft knee, or you can stand with one foot behind and to the side for a more stable base of support. If you use water weights, they should be held in a vertical position. Using the muscles of the back and posterior deltoid, pull the arms apart and bring them straight out from your sides. Then bring the arms towards each other using the pectoralis majors (chest muscles) until they meet in front of the body again. Gloves, water weights, or paddles will add more resistance. Bringing the arms out and back is one repetition. Start with six to ten repetitions in each set and work towards doing three sets with ten repetitions in each set, taking short rests between each set.

![Figure 140: Chest Flys](image)

**Chest Press**

This exercise strengthens the shoulders and the chest. Using water weights or a larger barbell helps add resistance. Stand in chest deep water with your arms outstretched from the shoulder and bent at a 90° angle at the elbow. Your hands hold the weights or barbell in a prone position and push the weights forward until the arms are straight. Then pull the weights back until the elbows bend at a 90° angle. Each forward and backward move equals one repetition. The forearms glide a few inches beneath the water’s surface and remain parallel to the pool floor. If you choose not to use weights, you will need to keep your hands flexed at the wrist and in the water in order to take advantage of the water resistance. Work towards three sets with ten repetitions in each set resting a few seconds between each set.

![Figure 149: Chest Press with dumbbells](image)
Upper Arm One

This exercise works the muscles of the upper arm (the biceps and triceps). Stand in chest to shoulder deep water with legs shoulder width apart and the knees soft. Begin with your arms fully extended and by the sides of your body. The palms of the hands are turned up in a cupped position. Keep the elbows and upper arms still and close to the body as you raise the palms upward from the elbows towards the surface of the water. Turn the hands over so the palms are facing down in a cupped position and then lower the forearms until the arms are straight again. The move up works the biceps and the move down works the triceps. Water gloves or paddles may be used for added resistance. Do six to ten repetitions and then relax for a few seconds working towards three sets with ten repetitions in each set. An alternative way for you to perform this exercise is to alternate the arms, working them one at a time.

Figure 152: Upper Arm One with paddles, alternating arms

Strength Training Exercise

You may also do this exercise with weights, but the buoyancy of the weights results in most of the work being done by the triceps in this position. When using weights, pair this exercise with Upper Arm Two or Upper Arm Three for a balanced workout.

Figure 153: Upper Arm One with dumbbells, side view
Appendix D: Range of Motion

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### Appendix E: Manual Muscle Test

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### Appendix F: FIQ scores
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