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# Aquomanual Therapy Program Development for Workers with Chronic Musculoskeletal Disorders

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## Abstract

**Objective:** The aim of this study was to develop an aquomanual therapy program for workers with chronic musculoskeletal disorders.

**Method:** This study was discussed intensively by the program development team, underwater exercise program based on the analysis of the development process program and developed a program of aquomanual therapy during 1 year. The therapy program development process consisted of analysis, design, and development components. Aquomanual therapy programs are man-to-man fundamental methods for treating chronic musculoskeletal disorders.

**Results:** All program treatment times were 60 minutes: adaptation to the water for 10 minutes, main treatment for 40 minutes, and cool down for 10 minutes. The main treatment consisted of static stretching; manually assisted movement; mobilization; and manipulation of the cervical spine, thoracic spine, shoulder complex, and lumbar spine. In addition, treatment plan was organized by body system and consisted of four main components.

**Conclusion:** Here we designed a new rehabilitation program by modifying land-based manual therapeutic techniques to meet the unique properties of bodies of water and maximize their benefits.

**Keywords:** Aquomanual therapy; Musculoskeletal disorders; Aquatic therapy

## Introduction

Approximately 25% of adults develop one or more musculoskeletal disorders, which are among the most common diseases in daily life, at some point in their lifespan [1]. Musculoskeletal disorders include whole body weakness in the musculoskeletal system or connective tissues due to sprains, strains, soreness, pain, and injury [2]. Studies have shown that musculoskeletal disorders of workers involve a variety of body parts including the neck, shoulders, lower back, nerve body, and the muscle and its surrounding tissues [3,4]. In particular, chronic pain is a complex emotional experience [5].

Previous studies have examined manual methods of treating musculoskeletal disorders [6,7]. Orthopedic manual therapy, a common treatment method for musculoskeletal disorders in workers [8], is increasingly used around restricted joints and tissues to reduce pain. Orthopedic manual therapy increases range of motion and normalizes arthrokinematic and rotation function [6]. Above all, orthopedic manual therapy normalizes movements by recovering joint movement slide and spin.

The existing aquatic therapies were divided into active patient-implemented methods and passive therapist-induced (patient-receiving) methods. The Halliwick aquatic therapy technique is a representative active aquatic therapy method [9]. In particular, the Halliwick 10-point programs consist of learning water adaptions that improve the body's sense of balance, movement, and breathing [9,10]. The Watsu method, the representative passive aquatic therapy technique, uses buoyancy and passive stretching massage methods in warm water [11]. The Watsu method has been recently applied as a stable treatment in pregnant women [12-14]. The Bad Ragaz Ring method, which uses body floating equipment, is a representative aquatic therapy that was developed in Switzerland of Bad Ragaz over several years [15]. The Bad Ragaz method employs the principle of proprioceptive neuromuscular facilitation [16].

Manual therapy integrates physical therapy, whole-body treatment, and relaxation principles [6-8,17]. Since the unique characteristics of water used with orthopedic manual therapy led to physical and cognitive function–related improvements in quality of life [18], we hypothesized that it would be a good method for treating workers with chronic musculoskeletal disorders. Water- and land-based therapies have been shown effective for the treatment of chronic musculoskeletal disorders. Therefore, here we attempted orthopedic manual therapy in the water for the treatment of workers with chronic musculoskeletal disorders. The purpose of the present study was to develop a new aqua therapeutic program that can aid with the recovery of workers with chronic musculoskeletal disorders.

## Material and Methods

In this study, workers with chronic musculoskeletal adapt the body for exercise as learning prior to exercise so they can proceed also step by step that can get condition of body recovery and help promote the development of an exercise program. The study duration was May 2014 to March 2015 and we analyzed the basic processes of the program through in-depth discussions between researchers prior to its development. The aquomanual therapy program development process included analysis, design, and development stages (Table 1).

### Program development team organization

The program development team consisted of one professor of physical therapy, four physical therapy researchers, and two physical

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| Stage | Date | Details |
|---|---|---|
| Analysis | 2014.03 | Develop a research team consisting of one professor, four researchers, and two physical therapy clinicians. |
| | 2014.04 | Form a committee consisting of two aqua physical therapists and one doctor of osteopathic medicine |
| | 2014.05–09 | Review previous studies |
| | 2014.09–11 | Analyze and evaluate current aquomanual therapy programs |
| Design | 2014.11 | Describe post-analysis goals |
| | 2014.11 | Verify program validity and reliability |
| | 2014.12 | Develop program contents |
| Development | 2015.01 | Produce a protocol |
| | 2015.01 | Conduct field practice |
| | 2015.02 | Modify program<br>Complete program |
| | 2015.03 | Conduct an aquomanual therapy program education seminar |

**Table 1:** Study protocol.

therapists. We also consulted two aqua physical therapists and one doctor of osteopathic medicine. Consults were made by e-mail and meeting.

## Program development process

In the analysis stage, the research team first reviewed the videos, textbooks, and handouts on musculoskeletal disorders. Next, we created the treatment program contents by establishing a target and reviewing the detailed contents. In the development phase, the research team developed orthopedic manual therapy and osteopathy methods and discussed the theory and practice of orthopedic manual therapy over 2 months. In the seminar, the development team presented theory and underwater practice principles to 30 physical therapists in a community welfare center. The participants practiced the program in a 25°C indoor swimming pool that was 1.2 m deep when the outdoor temperature was 27–30°C.

## Results

## The aquomanual therapy program was developed as follows:

Definitions of terms

Aquomanual therapy

The purpose of aquomanual therapy, which combines the words aqua and manual treatment based on joint, soft tissue mobilization, myofascial and muscle release methods, is to correct the spinal arrangement, joint and soft-tissue mobilization, and fascia and muscle relaxation for potential workers due to musculoskeletal problems, pain, and fatigue that interrupt the workers' daily life and lead to an accumulated fatigue health status.

## Elements of aquomanual therapy program

The aquomanual therapy program was 60 minutes long: 10 minutes to adapt to the water, 40 minutes of treatment, and 10 minutes of cool-down. The body parts included the cervical spine, thoracic spine, shoulder complex, lumbar, and lumbar spine. The treatments consisted of four static stretches, manually assisted movements, mobilization, and manipulation (Table 2). The aquomanual therapy program was organized by body part and consisted of four detailed treatments. Therapy was delivered on a one-to-one ratio of therapist to worker, and each patient wore an aqua inflatable neck collar (#707; Sprint, USA) and waist belt (aqua belt; SAEHAN, KOREA) to float in the supine position in the water.

| Body part | Treatment composition | Description |
|---|---|---|
| Cervical spine | Static stretching | Relax transverse ligament of the atlas<br>Passive neck extension and traction |
| | Manually assisted movement | Flexion-rotation |
| | Mobilization | Side flexion physiological glide |
| | Manipulation | Upper cervical spine<br>Mid- and lower cervical spine<br>Cervical thoracic junction |
| Thoracic spine | Static stretching | Side flexion |
| | Manually assisted movement | Passive flexion, extension, rotation, and side flexion |
| | Mobilization | Rotation and side flexion |
| | Manipulation | Posteroanterior extension |
| Shoulder complex | Static stretching | Shoulder flexion |
| | Manually assisted movement | Shoulder abduction |
| | Mobilization | Shoulder external rotation |
| | Manipulation | Shoulder internal rotation |
| | | Glenohumeral anteroposterior and inferior glide |
| | | Glenohumeral shoulder traction |
| Lumbar spine | Static stretching | Lumbar spine torsion relaxation |
| | Manually assisted movement | Lumbar side rotation |
| | Mobilization | Lumbar spine |
| | Manipulation | Side-lying rotational manipulation |

**Table 2:** Program composition.

## Discussion

Here we developed an aquomanual therapy program for treating chronic musculoskeletal disorders. The first stage of the program involved adaptation of the water modified by Watsu method, including feeling the water environment of flow, temperature and takes a deep breath for unfamiliar water of workers. The second stage was divided four parts of the body about cervical spine, thoracic spine, shoulder complex and lumbar spine.

Manually assisted movement was consisted with feel movement fine sense for full range of motion. Mobilization consisted of body relaxation while focusing on the vertebrae [6,7]. Manipulation consisted of correcting alignment, the main goal of this program, as well as loosening knotted muscles after mobilization [6].

This study considered the unique characteristics of water as follows. First, buoyancy and gravity. Archimedes' principle in particular states that when a body is immersed in a fluid, it will experience an upward thrust equal to the weight of the displaced fluid [18]. Buoyancy is the upward thrust acting in the opposite direction of gravity and is related to the specific gravity of the immersed object [12]. By definition, the specific gravity of water is 1.0; the specific gravity of a human averages 0.974, which implies that humans tend to float when immersed [13]. However, body mass (bone, muscle, and organs) has a specific gravity of 1.1, while fat has a specific gravity of 0.9. Buoyancy can be used with assisted (passive), active assisted, supported (active), or resisted range of motion [19,20]. Therefore, one may have difficulty floating due to their body composition, which causes them to rest slightly below the water's surface, or their lean extremities may sink while their trunk remains at the surface. Consequently, buoyant equipment may be necessary on the trunk or at various points along the limb to maintain buoyancy in the pool. In addition, Pascal's law of hydrostatic pressure states that at any given depth, the pressure from the liquid is exerted equally on all surfaces of the immersed object [19].

In this study, the body part composition of the four treatments was applied to normalize the mobilization movement range, recover joint function, and relieve pain. We adjusted the treatment composition by body part to normalize the movement range of mobilization, recovery joint function, and relieve pain. One previous study confirmed that range of motion contributes significantly to hip joint recovery of musculoskeletal disorders in orthopedic manual therapy [8]. Mobilization consists of static stretch, traction, and nerve mobilization exercises [7,21]. Manipulation consists of treatment through movement of soft and fast in local body area of workers. The application of manipulation involves synovial membrane heat, hypertonus muscle and joint, joint synechia, and abnormal segment alignment [21]. Even if a patient undergoes passive underwater treatment, buoyancy has the advantages of providing assistance, support, and resistance to body movements [13,22]. Used properly, the principles of aquomanual therapy ultimately provide a relaxing treatment. These principles and effects of water can ultimately lead to functional recovery and comprise a comfortable treatment method for workers and therapists.

This study was meaningful to development program from application orthopedic manual therapy to water for workers with chronic musculoskeletal disorders. Future research is needed to verify the effects of various interventions employing aquomanual therapy.

## Conclusions

Here we developed an aquomanual therapy program for workers with chronic musculoskeletal disorders. This new rehabilitation program adapted land-based manual therapeutic methods to the unique properties of water to maximize their benefits. Further clinical studies are needed to disseminate the program and train instructors to implement this program for workers with chronic musculoskeletal disorders.

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