Making a Difference: Movement Matters for People with Developmental Disabilities

Stephanie Getzen, &
Stacey Westphal
Students, Master of Science in Occupational Therapy Program

Author Biography

Stephanie and Stacey are occupational therapy students from Saginaw Valley State University, who have conducted research on the impacts of aquatic therapy on those persons with developmental disabilities. Through their research project and the help of resource *Health Matters: The Exercise and Nutrition Health Education Curriculum* by Beth Marks, Jamina Sisirak, and Tamar Heller, they were able to compile this book as a guide for those with developmental disabilities.

Acknowledgments

Thank you to everyone who was involved in the research project which made this book possible: the fieldwork students, research participants, and staff of the facility.

Janet Giem, B.S.,OTRL: Thank you for all of your time and dedication to the research project.

Felicia McRae, B.A., B.S., OTRL: Thank you for allowing us to present this book to your facility.

Dr. Ellen Herlache, Ed.D., MA, OTRL: Research Coordinator and Program Director: Thank you for making the whole research project possible and your dedication to the entire process.

Megan Baldwin: Aquatics Director at Saginaw Valley State University: Thank you for allowing us to use the campus pool and equipment for pictures.

Table of Contents

Introduction

This aquatic therapy book was compiled from prior literature, student research, and general knowledge. Exercises provided were taken from a book (Marks, Sisirak, & Heller, 2010) used for developing exercise routines on land for persons with developmental disabilities. All exercises were adapted from land to the aquatic environment intended for creating a pool program protocol by therapists, parents, and anybody interested in the benefits of aquatic therapy for those persons with developmental disabilities.

All of the warm-up, stretching, and pool exercises can be performed either on land or in the water. However, the purpose of the book is to display ideas for exercises that can be performed in the water. Lastly, due to prior research and knowledge it is imperative to grade exercises in order to see results in strength gain. This means to start with either no weight or the foam bar bells and work the client up to weighted exercises.

What are Developmental Disabilities?

In the United States, it is estimated that every one out of six children ages three to seventeen have at least one developmental disability (Boyle et al., 2011). This represents an estimated increase of 1.8 million children when compared to a decade earlier (Boyle et al.2011). According to Boyle and colleagues (1994), developmental disabilities are defined as "…a collection of chronic conditions originating in childhood, [which] are manifested as physical, psychological, cognitive, or speech impairments" (p. 399). Developmental disabilities are typically life-long and can affect areas such as speech, eyesight, hearing, and mobility (Boyle et al.).

"Developmental disability" is an umbrella term for numerous conditions such as autism spectrum disorder (ASD), Down syndrome, cerebral palsy (CP), learning disabilities, attention deficit hyperactivity disorder (ADHD) and other developmental delays (Boyle et al., 2011). According to Getz et al. (2006b), due to the diverse range of ability levels seen in persons with developmental disabilities, new intervention plans should be researched and developed to help increase independence for these persons.

The Importance of Physical Activity with Persons with Developmental Disabilities

Exercise is especially important for persons with developmental disabilities, as it can help to increase endurance and lung capacity, and lower resting heart rate. In addition, exercise can help decrease joint injuries, muscle weakness, and difficulties with balance (Fragala-Pinkham, Haley, & O'Neil, 2008). Improvements in muscle strength and endurance, flexibility, body composition, and cardiovascular endurance can benefit all individuals, particularly those with developmental disabilities (Rimmer, 1996). Exercise can also help increase longevity, and lower morbidities associated with many conditions seen in persons with developmental disabilities (Sutherland, Couch, & Iacono, 2002).

According to Fragala-Pinkham, Haley, and O'Neil (2008), research suggests that strength training and aerobic exercise is beneficial to children with developmental disabilities. Exercise has been shown to improve muscle strength, aerobic capacity, and gross motor function in persons with CP (Kelly & Darrah, 2005). Carter et al. (2004) suggested that low impact aerobics can improve strength in persons with developmental disabilities. The results of a systematic review by Dodd, Taylor, and Damiano indicated that an exercise training program can be effective in increasing strength of persons with CP (Dodd, Taylor, & Damiano, 2002).

In general, theories based on the interaction of activities and a person's body function, have proposed that exercise can benefit persons with developmental disabilities. One theory that has been used to explain the benefits of exercise on persons with developmental disabilities is the dynamic systems theory. The dynamic systems theory proposes that muscle strength and flexibility can be promoted by interactions between a person, activity, and the environment that occur during a structured exercise program. Based on these ideas of the dynamic systems theory, therapists in the United States and globally have been encouraged to use exercise programs as part of intervention plans for persons with developmental disabilities (Kelly & Darrah, 2005).

Benefits of Aquatic Therapy with Developmental Disabilities

A study by Fragala-Pinkham, Haley, and O'Neil (2008) suggested that muscle strength and aerobic capacity in persons with a variety of developmental disabilities may be improved because of the resistive forces encountered in the aquatic environment. One variable that was found to particularly impact upper extremity function was exercise intensity. The researchers suggest future studies integrate the use of wrist and ankle weights, and paddles to increase exercise intensity. Additionally, it is suggested that because the act of swimming involves upper extremity movements, researchers should focus on the impacts of aquatic interventions on upper extremity strength.

One developmental disability for which researchers have tested the effectiveness of aquatic therapy is CP. In a literature review by Kelly and Darrah (2005), it was found that some of the characteristics of water that benefit children with CP are buoyancy, resistive forces, and the gentle environment. For persons with CP, these aspects of the water are beneficial because of postural support, strengthening, and support provided by the buoyant environment that can help decrease motor impairments and muscle tone abnormalities (Kelly & Darrah).

Additional advantages of aquatic therapy, according to Kelly and Darrah (2005), are amplified cardio-respiratory endurance, a reduction in time to finish the half mile walk or run, and better ability to maintain target heart rate for a longer period of time. In addition, there were improvements in strength and flexibility in the participants with CP (Kelly & Darrah).

Many persons with Down syndrome have sedentary lifestyles, which can lead to shortened life expectancies (Sutherland et al., 2002). According to Goodwin (2007), aquatic swimming programs help reduce unhealthy lifestyles in persons with Down syndrome by encouraging improvements in endurance, balance, social interactions, and self-care skills. Goodwin completed an aquatic program with person with Down syndrome, which consisted of swimming activities such as hopping, twisting, walking backwards and jumping jacks. These exercises were carried out three times a week, for thirty minutes each session. The researcher did not investigate physiological impacts of the program. However, the results indicated that all participants thoroughly enjoyed the aquatic program (Goodwin, 2007).

Benefits of Aquatic Therapy with Developmental Disabilities Continued

Literature has shown that theories have applied to aquatic programs. For example, the dynamic systems theory encourages therapists to consider all aspects of a client including the environment, person, and activities, as well social interaction, when designing activities to improve functional abilities for everyday life (Kelly & Darrah, 2005). Exercise can play a role in promoting health in persons with developmental disabilities, by increasing endurance and lung capacity, which in turn will increase independent living and functional abilities (Fragala-Pinkham et al., 2008).

Safety Precautions

When performing any type of exercise in or out of the pool, always be sure to follow safety precautions and suggestions to prevent any unnecessary injury while exercising.

***General Safety Suggestions to Prevent Accident or Injury in the Pool Area**:*

* Have a lifeguard on duty at all times

*Pool activities remain under four hours per day

*Encourage clients to be careful when entering and exiting the pool, due to slippery floors

*Take extra precautions when using equipment to assist clients in transferring in/out of the pool

*Being aware of those persons with visual and hearing deficits

(Wylke, 2003)

***Exercise Precautions**:*

* Wear correct clothing for a lowered chance of tripping, falling, and a more comfortable exercise experience

-> Examples for exercises on land: tennis shoes, t-shirts and sweatpants

-> Examples for Water Exercises: one-piece swimsuit, water shoes to prevent s slipping, goggles to keep water out of eyes, and hair ties

*Get approval from doctor or health care provider to start exercising

*Choose a good time to exercise

* Always stretch first with exercise activities and follow with cool-down to prevent injuries to muscles, tendons, and ligaments

*Begin slowly and exercise often

(Marks, Sisirak, & Heller, 2010)

Warm-Up/Cool-Down

Why are warm-ups important?

Warm-ups are an essential part of any type of exercise because they allow the muscles to warm up before stretching and exercising. These exercises also help the individual to prepare mentally for the exercise to come. Overall, warm-ups increase heart rate and blood flow, decreasing the chance of muscle or joint injury and soreness by "loosening up" the muscles (Marks, Sisirak, & Heller, 2010).

Why is a cool-down important?

Cool-downs help to keep the blood flow circulating throughout the body and decrease the likelihood of issues such as blood pooling in the legs, lightheadedness, and/or dizziness (Marks, Sisirak, & Heller, 2010).

Tips for Warm-up & Cool-Down Exercises

Always advise your client to breathe through their nose and mouth while exercising. Exercising with a steady pace gives muscles time to relax. Also, if any movement is painful do not have client continue or force the exercise. It is recommended that before and after exercise to warm-up and cool-down anywhere from 5-10 minutes (Marks, Sisirak, & Heller, 2010).

Which muscles should I warm-up and cool-down?

-head and neck
-chest muscles
-shoulder and arms
-trunk and spine
-hips, knees, and ankles
(Marks, Sisirak, & Heller, 2010)

* Note: The following exercises are based from exercises performed on land. Prior research suggests that they may be modified for an aquatic program.

Warm-Up and Cool-Down Exercises

Figure 1- Shoulder Rolls: Stand or sit in the upright position and roll shoulders forwards and backwards for about 5 seconds (Figure 1 and 2). Then, roll shoulders backwards and forwards for about 5 seconds.

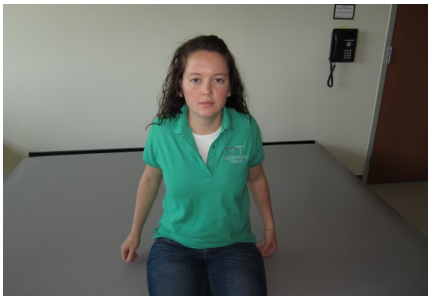

Figure 1

Figure 2

Figure 2- Shoulder Shrugs: Stand or sit in an upright position and lift shoulders up towards the ears (Figure 3 and 4). Then, drop them down towards the floor. Do this for about 5-10 seconds.

Figure 3

Figure 4

Warm-Up and Cool-Down Exercises Continued

Figure 3- Head and Trunk Turns: Stand or sit upright and make a fist while keeping elbows bent and forearms parallel to the ground (Figure 1). Then, rotate side to side while keeping elbows bent at a 90 degree angle against the side of the body(Figure 2). Do10 repetitions.

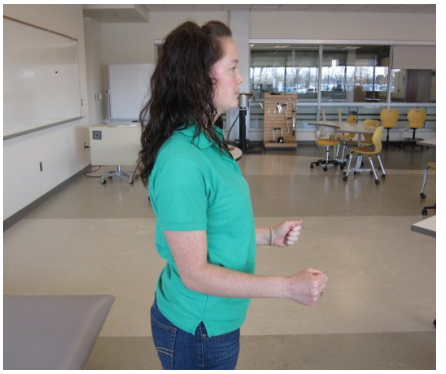

Figure 1

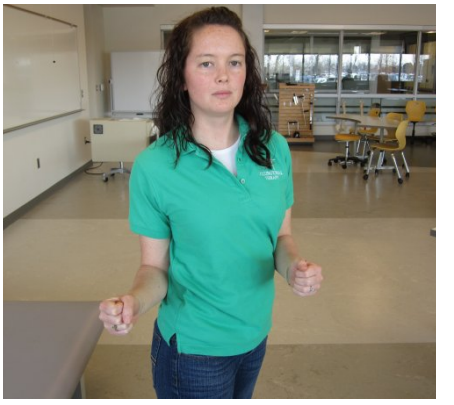

Figure 2

Figure 4- Leg Lifts: Sit in a chair with feet flat on the ground with knees bent (Figure 3) [may have to scoot to the edge of the chair], and kick right leg out so it is parallel to the ground then bring it back down to the floor (Figure 4). Repeat with left. Do 5 times for each leg.

* If this exercise is performed in the water, have client hold the side of the pool while standing for safety, if needed.

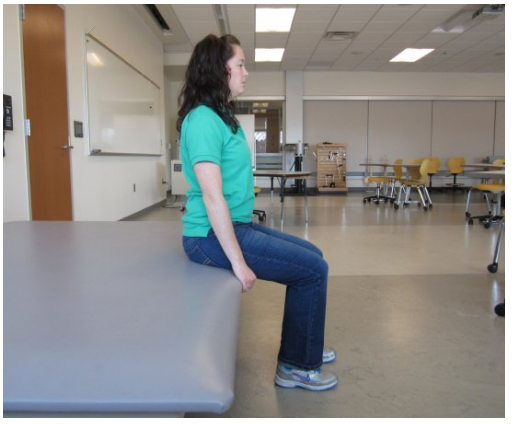

Figure 3

Figure 4

Warm-Up and Cool-Down Exercises Continued

Figure 4- Arm Diagonals: Stand or sit in the upright position. Make a cross with both arms in front of hips (Figure 1). Then, lift arms above the head and make a cross(Figure 2). Finish by bringing arms back down to hips. Repeat 5-10 times.

Figure 1

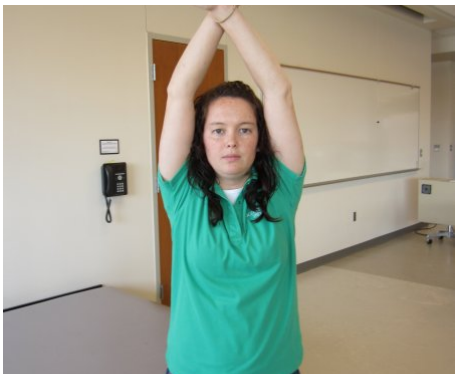

Figure 2

Figure 5- Arm Circles: Stand up tall with the both hands and arms parallel to the floor (like an airplane) with palms facing the floor. Rotate arms in a continuous circle, first forwards then backwards (Figure 3). Repeat 5-10 times in each direction.

Figure 3

Warm-Up and Cool-Down Exercises Continued

Figure 7- Ankle Pump: Sit tall on edge of chair with feet flat on the ground. Push toes into the ground while raising the heels (Figure 1). Then push heels into the ground while raising toes towards the ceiling (Figure 2). Repeat this pattern for 5-10 seconds.
* If this exercise is performed in the water, have client hold the side of the pool while standing for safety, if needed.

Figure 1

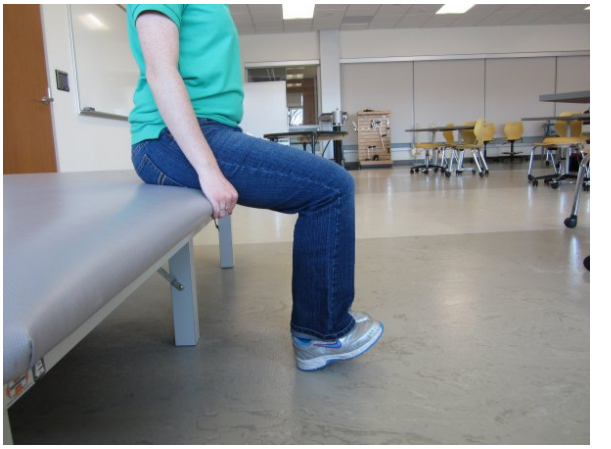

Figure 2

Figure 8- Ankle Circles: Sit tall on edge of chair. Keeping the right leg straight, make a circle with ankle in a continuous motion for 5-10 seconds (Figure 3 and 4). Repeat with left ankle for 5-10 seconds.
* If this exercise is performed in the water, have client hold the side of the pool while standing for safety, if needed.

Figure 3

Figure 4

Warm-Up and Cool-Down Exercises Continued

Figure 9- Walk it Out: Sit in a chair with feet flat on the ground and knees bent (the client may have to scoot to the edge of the chair), and alternate movement of each leg by moving knees toward the ceiling, then placing foot back on the floor continuously (Figure 1 and 2). Do 5 times for each leg.
* If this exercise is performed in the water, have client hold the side of the pool while standing for safety, if needed.

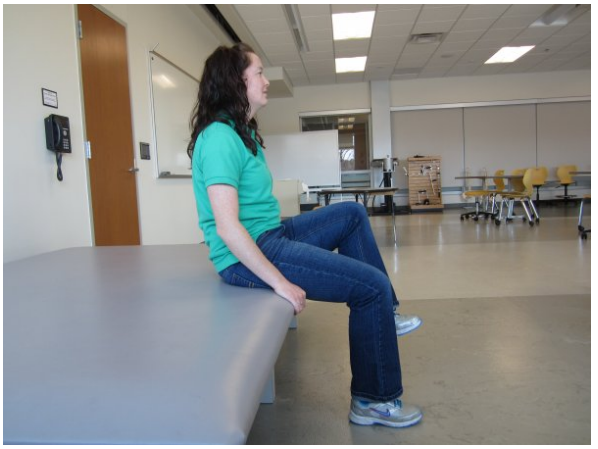

Figure 1

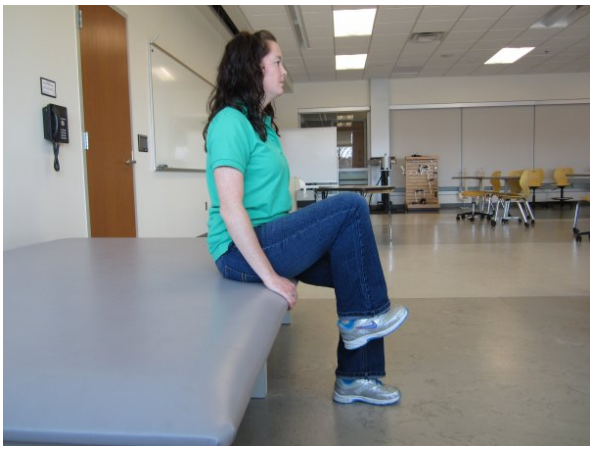

Figure 2

Stretching

Why is Stretching Important?

The purpose of stretching before any exercise is to help prevent injury or unnecessary stiffness to the joints. It also helps to avoid muscle weakness that may result from a painful joint or a less active lifestyle. Stretching also provides the muscles and joints with the ability maintain and gain strength (Marks, Sisirak, & Heller, 2010).

Tips for Stretching:

Any individual who is stretching should stretch each joint and muscle as far as possible, but not to the point of pain. Each stretch should be slow and steady, without any bouncing movements. Each stretching exercise should last for 5-10 seconds, feel comfortable, and be performed 5-10 times (Marks, Sisirak, & Heller, 2010).

Joints/Muscles that should be stretched:

-head and neck
-chest muscles
-shoulder and arms
-trunk and spine
-hips, knees, and ankles
(Marks, Sisirak, & Heller, 2010)

* Note: The following exercises are based off of a land-based exercise program. Prior research suggests that they may be modified for an aquatic program.

Stretching Continued

Examples of stretches that can be performed before doing any type exercise on land or in the pool:

*Remember to always stretch both sides for 5-10 seconds with each individual movement.

Head and neck:

Figure 1-Side Neck Stretch: Place right hand on the head with fingertips touching the top of the left ear, gently pull down towards right shoulder(Figure 1). Repeat with left side.

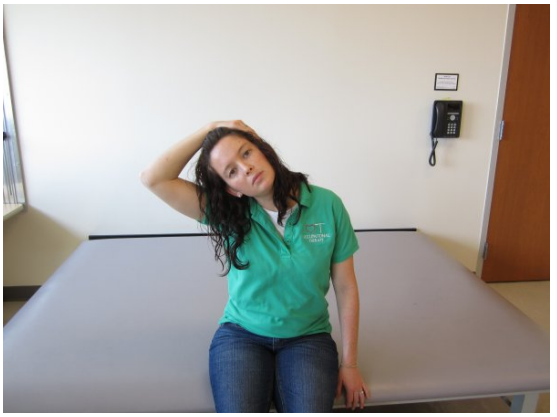

Figure 1

Figure 2-Neck Rotation: Place right hand on right side of lower jaw and push gently towards left shoulder (Figure 2). Repeat with left side.

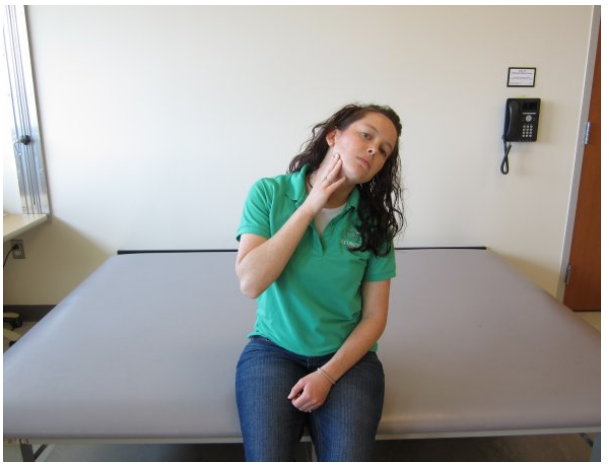

Figure 2

Stretching Continued

*Remember to always stretch both sides for 5-10 seconds with each individual movement.

Chest muscles:

Figure 3-Chest Stretch: Stand up tall with hands and arms parallel to the floor (like an airplane) with palms facing up. Have client push back arms as far as possible comfortably, like they are trying to reach someone behind them (Figure 1 and 2).

Figure 1

Figure 2

Stretching Continued

Shoulder and arms:

Figure 5-Shoulder Stretch: Place right arm straight out in front of the body and move it across the chest. Take left arm and reach towards the arm pit, while placing left hand above right elbow. Then gently pull towards chest. Repeat with left side.

Figure 1

Figure 6-Bicep Stretch: Stand up tall with the both hands and arms parallel to the floor (like an airplane) with thumbs facing the floor. Rotate arms as far as possible comfortably, trying to rotate palm up (Figure 2).

Figure 2

Stretching Continued

Trunk and Spine:

Figure 7-Side Bends: Stand up tall with hands to the sides (Figure 1). Bend to the right trying to touch the floor with right hand (Figure 2). Repeat with left side.

Figure 1

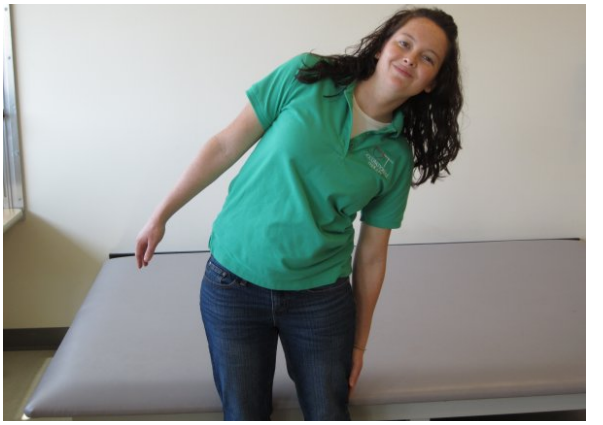

Figure 2

Figure 8-Upper Back: Stand up tall with arms out in front of the body. Place thumbs pointed towards the floor and clasp hands (Figure 3). Round shoulders while shrugging them towards the neck.

Figure 3

Stretching Continued

Ankle Stretches

Figure 9-Ankle Stretch: Sit tall on edge of chair, with feet flat on the ground. Push toes into the ground while raising the heels (Figure 2). Then push heels into the ground while raising toes towards the ceiling (Figure 3).
*If this exercise is performed in the water, have the client hold the side of the pool while standing for safety, if needed.

Figure 2

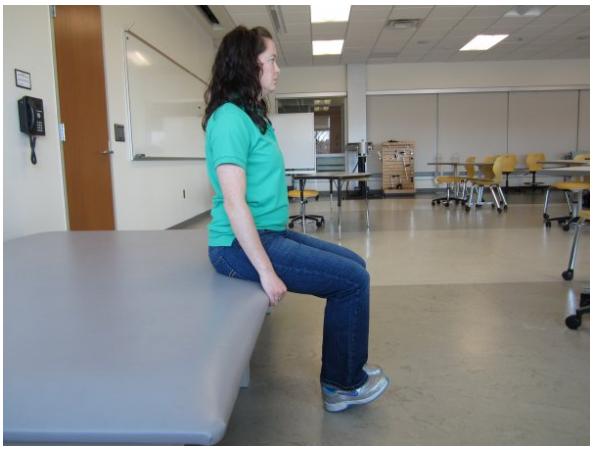

Figure 3

Common Aquatic Exercises

The following exercises can be performed on in water or on land (they will be shown being performed in water).

Leg Exercises

- Aqua Jog
- Aqua Walk
- Plantar Flexion
- Knee Flexion
- Hip Flexion
- Hip Extension
- Side Leg Raise

Arm Exercises

- Side Arm Raises
- Bicep Curls
- Shoulder Press
- Shoulder Flexion
- Tricep Extension
- Shoulder Extension

* Note: The following exercises are based from exercises performed on land. Prior research suggests that they may be modified for an aquatic program.

Aquatic Leg Exercises

Aqua Walk/ Aqua Jog

The aqua walk (Figure 1) is an exercise used to warm up the muscles as the client begins exercising in the pool. To perform the exercise, walk in the shallow end of the pool. When the body begins to warm-up, they may perform the aqua jog to increase the intensity.

To perform the aqua jog, start by standing with both feet on the floor of the pool in waist deep water (Figure 2). Then replicate running in place by lifting one knee towards the ceiling and kicking back the heel (Figure 3), then place foot back onto the ground as while lifting the other knee towards the ceiling (Figure 4). Repeat at a steady pace.

* Have client hold the side of the pool for safety, if needed.

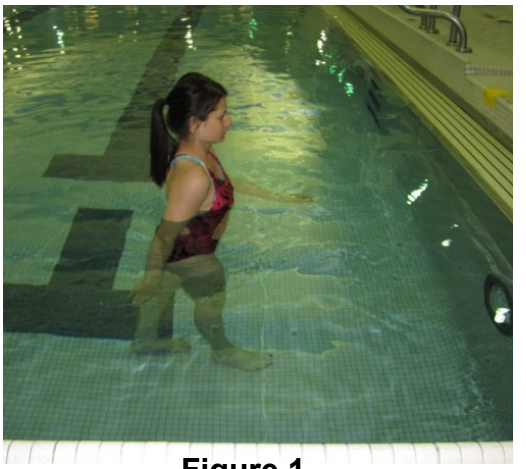

Figure 1

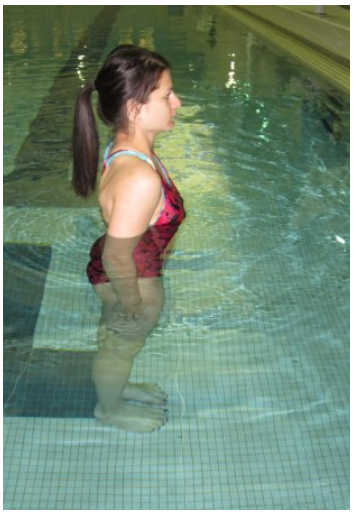

Figure 2

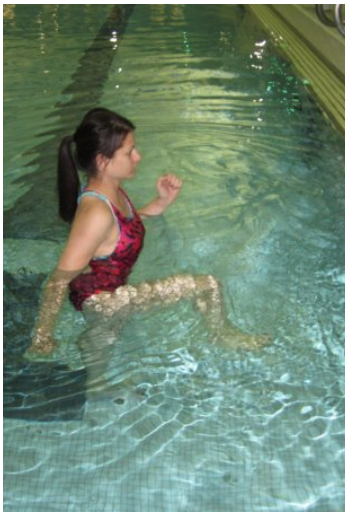

Figure 3

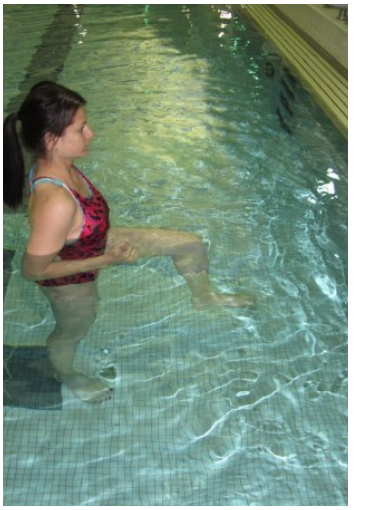

Figure 4

Plantar Flexion

Start out by holding the side of the pool for balance (Figure 1). Begin by slowly standing on tiptoes as high as possible; hold position for 2-5 seconds (Figure 2), then lower heels slowly back down to the pool floor. Repeat this exercise 8-15 times, then rest and repeat one more time.

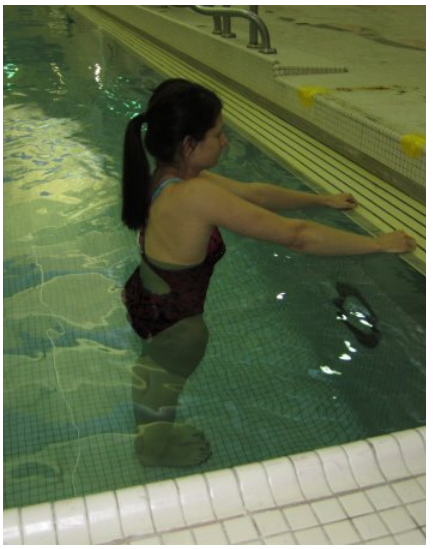

Figure 1

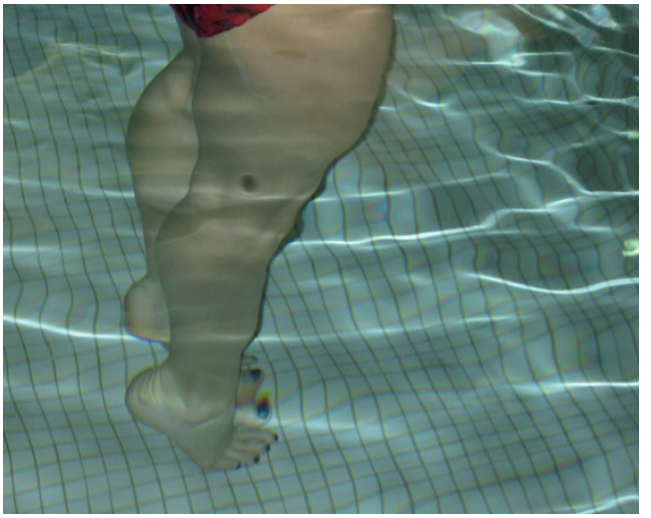

Figure 2

Knee Flexion

Start out by holding the side of the pool for balance (Figure 1). Begin by raising foot behind as far as possible, and then slowly bending knee (Figure 2). Hold this position for 2-5 seconds, and slowly place foot back to the floor of the pool. Repeat with other leg. Perform 10 repetitions each leg.

Figure 1

Figure 2

Hip Flexion

Stand holding the edge of the pool for balance. Begin by raising knee towards the ceiling and holding for 5 seconds (Figure 1). Repeat with other leg for 8-15 repetitions on each leg.

Figure 1

Hip Extension

To perform the hip extension exercise be sure to have the client 10-18 inches from the side of the pool, holding on to the edge of the pool for balance (Figure1). Begin by slowly raising one leg straight behind and bending at the hips (Figure 2). Hold this position for 5 seconds, and repeat with other leg.

Figure 1

Figure 2

Side Leg Raise

Perform this exercise by holding onto the side of the pool with left hand for balance (Figure 1). Begin by slowly raising right leg out to the side 6-12 inches and hold for 3 seconds (Figure 2). Slowly lower leg back down to the floor pool. Make sure to keep knees and spine straight the whole time. Turn so right hand is on the side of the pool and repeat lifting with left leg. Do 7 repetitions on each leg.

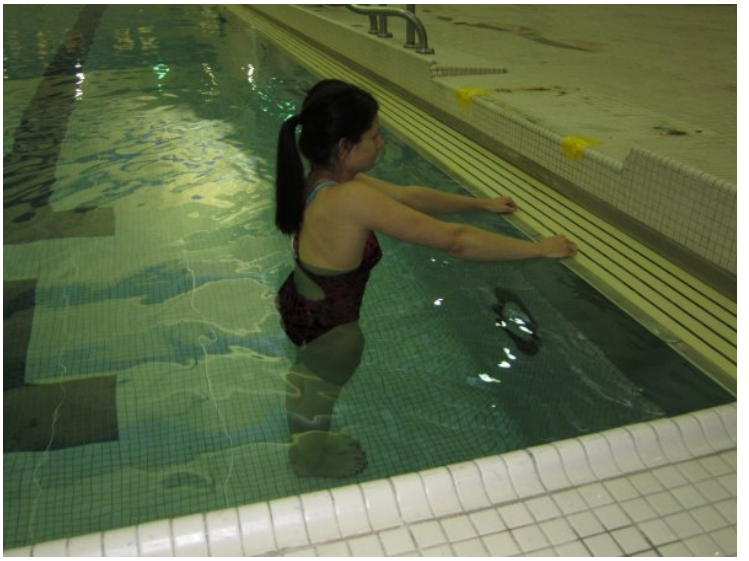

Figure 1

Figure 2

Aquatic Arm Exercises

Note: These arm exercises can and should be performed with additional weight as client progresses for better results.

Side Arm Raises

Stand with both feet flat on the pool floor with arms straight to the side so hands are in the water (Figure 1). Lift both hands, moving arms straight out from sides of body until reaching at a 90 degree angle (making an airplane with arms). Hold for 3 seconds. Repeat 10 times (Figure 2).

Figure 1

Figure 2

Bicep Curls

Stand with both feet on the pool floor with arms at the side with hands in the water. Slowly bend elbow, lifting hand to the shoulder with palm facing up. Keep hand on shoulders for 1 second, then slowly bring hand back down to the water. Repeat with other hand for 8-15 repetitions each hand.

Figure 1

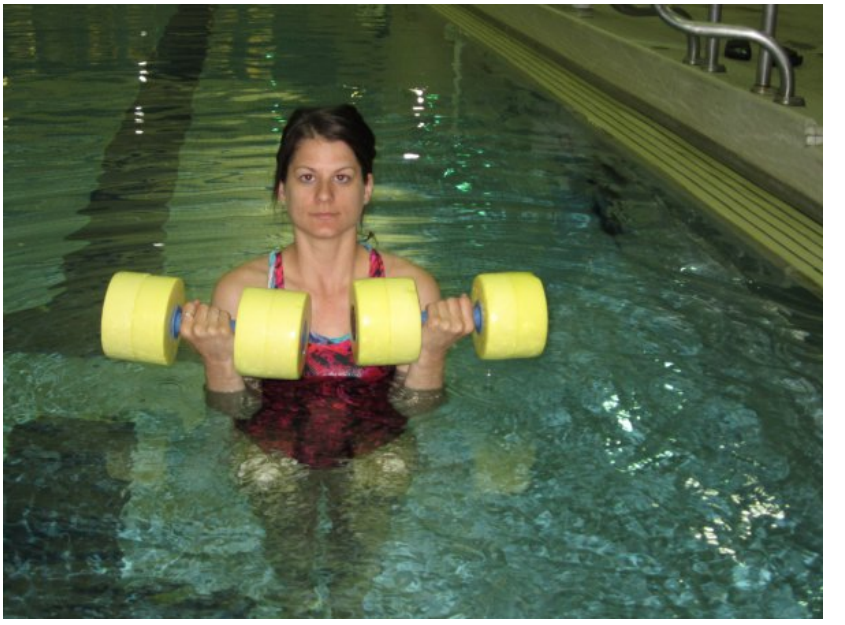

Figure 2

Shoulder Press

Start with both feet flat on the pool floor, and elbows at side with thumbs touching shoulders and palms facing each other. Slowly raise hands towards the ceiling while straightening out arms over the head. Hold this position for 1-2 seconds, then slowly lower arms back down to the starting position. Perform 8-15 times for both arms.

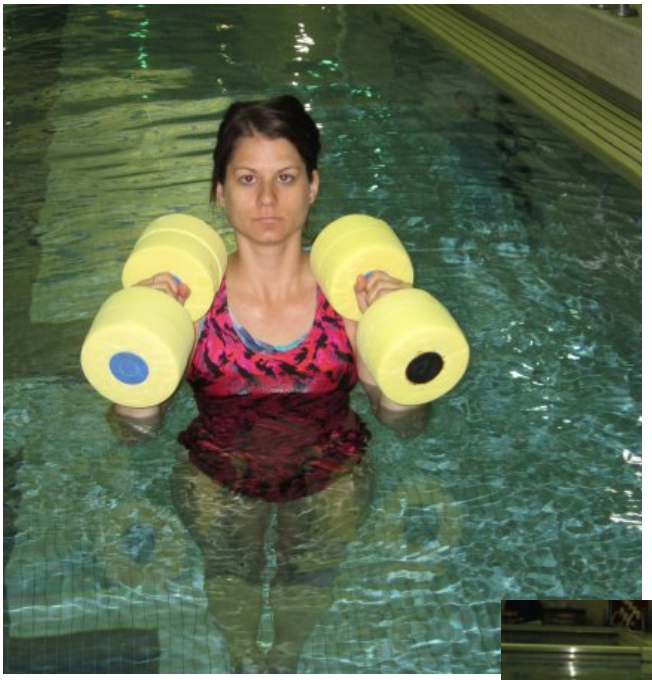

Figure 1

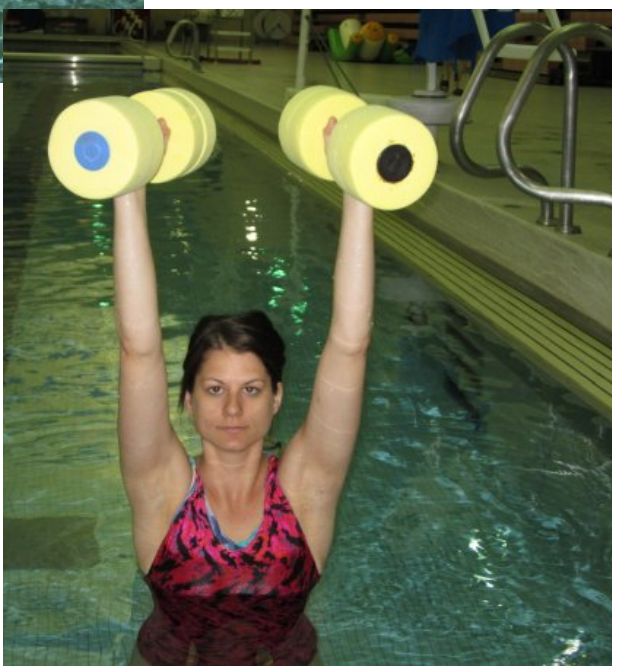

Figure 2

Shoulder Flexion

Begin with both feet flat on the pool floor, with arms out in front and palms down (Figure 1). Raise arms slowly in front towards the ceiling (Figure 2) and hold for 1-2 seconds. Then, slowly lower them back down. Repeat 8-15 times with each hand.

Figure 1

Figure 2

Tricep Extension

Begin with both feet flat on the pool floor. Take right arm and bend the elbow with palm facing in and hand close to the ear. Support the right arm by holding underneath elbow with the left hand (Figure 1). Slowly begin the motion by lifting arm towards the ceiling and holding for 1 second and slowly lowering back down (Figure 2). Repeat this motion 8-15 times with both arms.

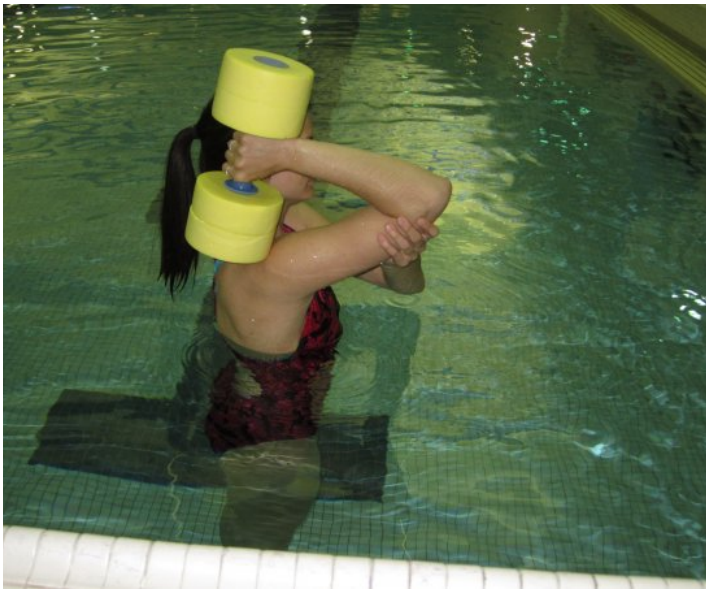

Figure 1

Figure 2

Shoulder Extension

Start with both feet flat on the pool floor. Arms should be straight at side with hands in the water and palms facing in towards body (Figure 1). Slowly move arm straight behind, using water as resistance (Figure 2). Hold for 1 second, and slowly bring arm back to side. Repeat with both arms 8-15 times.

Figure 1

Figure 2

References:

Boyle, C.A., Boulet, S., Schieve, L.A., Cohen, R.A., Blumberg, S.J., Yeargin-Allsopp, M., Visser, S., & Kogan, M.D. (2011). Trends of prevalence of developmental disabilities in US children, 1997-2008. Pediatrics, 127 (6), 1034-1042.

Boyle, C.A.,Decoufle, P., & Yeargin-Allsopp, M. (1994). Prevalence and health impact of developmental disabilities in US children. Pediatrics, 93(3), 399-403.

Carter, M.J., McCown, K.M., Forest, S., Martin, J., Wacker, R., Gaede, D., & Fernandez, A,T. (2005). Exercise and fitness for adults with developmental disabilities: Case report of a group intervention. Therapeutic Recreation Journal, 38(1), 72-84. Retrieved from http://0-proquest.umi.com.library.svsu.edu/pqdweb?did=643889241&sid=1&Fmt=6&clientId=23798&RQT=309&VName=PQD.

Dodd, K.J., Taylor, N.F., Damiano, D.L. (2002). A systematic review of effectiveness of strength-training programs for people with cerebral palsy. Archives of Physical Medicine Rehabilitation, 83, 1157-1164. Retrieved From http://0-www.sciencedirect.com.library.svsu.edu/science?_ob=MiamiImageURL&_cid=272381&_user=1515933&_pii=S0003999302000424&_check=y&_origin=gateway&_coverDate=31-Aug-2002&view=c&wchp=dGLzVlVzSkWb&md5=ac233bf8f3551d004835ba80b93fffd7/1-s2.0-S0003999302000424-main.pdf.

Fragala-Pinkham,M., Stephen,M.H., O'Neil, M.E.(2008).Group aquatic aerobic exercise for children with disabilities. Developmental Medicine and Child Neurology,50 (11), 822-827. Retrieved from: http://0-search.proquest.com.library.svsu.edu/docview/195603210/fulltextPDF/134B9CCC7D177EE682C/1?accountid=960.

Getz, M., Hutzler, Y., & Vermeer, A. (2006b). The relationship between aquatic independence and gross motor function in children with neuro-motor impairments. Adapted Physical Activity Quartely, 23,339-355.

Goodwin, C. (2007). Exploring the effects of a swim program for clients with down syndrome. OT Practice, 17-21.

References Continued

Kelly, M., & Darrah, J. (2005). Aquatic exercise for children with cerebral palsy. Developmental Medicine and Child Neurology. 47(12), 838-842. Retrieved from http://proquest.umi.com/pqdweb?did=1062470881&sid=1&clientId=23798&RQT=309&VName=PQD.

Marks, B., Sisirak, J., & Heller, T. (2010). Health matters: the exercise and nutrition health education curriculum for people with developmental disabilities. Baltimore, MD: Paul H. Brookes Publication Company.

Static strectching exercises. (2012). Retrieved March 15, 2012 from http://www.brianmac.co.uk/stretch.htm

Sutherland, G., Couch, M.A, & Iacono, T. (2002). Health issues for adults with developmental disability. Research in Developmental Disabilties, 23, 422-445. Retrieved from http://0-www.sciencedirect.com.library.svsu.edu/science?_ob=MImg&_imagekey=B6VDN-472JGCX-4-D&_cdi=5987&_user=1515933&_pii=S089142-2202001439zSkWA&md5=51b54e4401fb29c74fe323236669d77&_orig=browse&_coverDate=12%2F31%2F2002&_sk=999769993&view=c&wchp=dGLzVlz-0&ie=/sdarticle.pdf.

Wylke, M. (2003). Safety first. Retreived on March 15, 2012 from http://www.rehabpub.com/features/72003/4.asp

Making a Difference: Movements Matters for People with Developmental Disabilities