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Lourdes Torres Escobar

Mary E. Sanders  
*University of Nevada*

Daryl Lawson

Charo Belenguer Benitez

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# **A Case Study: Mobility and Health Impact of an Aquatic Fitness Program for a Woman With Intellectual and Physical Disabilities**

**Lourdes Torres Escobar, Mary E. Sanders, Daryl Lawson,  
and Charo Belenguier Benitez**

Physical activity leads to better health and improved quality of life; however, many people with disabilities have limited mobility capabilities. The purpose of this case study was to determine the impact of a 16-month water exercise program on the mobility and quality of life for a 27-year-old woman, Andrea, diagnosed with severe mental and physical disabilities. The Waterfit Golden Waves® program, designed for healthy older adults, was adapted for Andrea. Under physician supervision, water exercises were performed with a personal trainer, primarily in shallow water, 3 days/week, 30 – 40 minutes per session. Training objectives included cardiovascular and muscular endurance, flexibility, and activities of daily living (ADL). Pre and post assessments included circumference measures, joint range of motion, body composition, resting heart rate, and periodic video recordings of mobility. An outside evaluation by a licensed psychologist measured social and emotional outcomes. Results indicated improvements in multiple areas to the extent that Andrea could now extend her spine enough to lie on her back. ADL mobility improvements included stair climb, sit to stand, walking speed and walking distance without aide. Andrea's quality of socialization and emotional well-being improved, as well. Time-lapse recordings of Andrea's program and progress are included as links. In conclusion, this water fitness program, adapted to meet individual needs of a person with severe disabilities, was found to be effective in improving mobility, health, and quality of life for one woman. Further research is needed to measure the impact of water fitness protocols adapted for people who are intellectually and physically disabled.

Physical activity leads to better health and an improved quality of life. Children and adults with disabilities have increased their physical activity levels and improved their cardiovascular endurance during water exercise programs (Blohm,

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Lourdes Escobar Rorres is a physician in Castellon, Spain and has a Bachelor of Medicine and Surgery and is also a WaterFit Medical Exercise Specialist. Mary Sanders is a Registered Clinical Exercise Physiologist at the Wellness and Weight Management Clinic, University of Nevada School of Medicine, Reno, NV. She is also the Director of WaterFit®/Golden Waves®. Daryl Lawson is an associate professor with the Department of Physical Therapy at Elon University in Elon, NC. Charo Belenguier Benitez is a Water Fit® trainer working with special needs children in Castellon, Spain.

2011; Frangala-Pinkham, O'Neil & Haley, 2010; Sanders & Escobar, 2010). Many people with disabilities face unique challenges to active living. The National Center on *Health, Physical Activity, and Disability* (National Center on *Health, Physical Activity, and Disability* [NCHPAD], 2012) is a collaborative organization dedicated to promoting physical activity and disability research. According to Dr. James Rimmer, Lakeshore Foundation Endowed Chair in Health Promotion and Rehabilitation Sciences at the University of Alabama at Birmingham and Director of the NCHPAD, the center is the first *research-to-practice* collaboration in physical activity and disability (NCHPAD, 2012). One of their targets is to promote the health and wellness of people with disabilities. The active living challenge is global! Therefore, in the spirit of support for NCHPAD, we'd like to share with you our 16-month case study about a Spanish woman, who discovered new freedom of movement in the pool. Her participation in an adapted program, originally designed for healthy older participants, changed her life on land. According to Juan Vázquez, "Water serves as an amplifier of behaviors. We can use this to get to know our students and to help them to transfer the movements carried out in the aquatic medium to the land" (Vázquez, 1999).

## Purpose

The purpose of this case study was to determine the impact of the WaterFit Golden Waves® program, adapted as an individually tailored approach for training a woman diagnosed with severe disabilities. The program was found to be effective for improving general health and functional activities of daily living (ADL) among independent, community dwelling women (mean age 73.6 years), with some chronic and medical conditions (Constantino, Maloney-Hills & Sanders, 2003; Sanders, 2006; Sanders & Maloney-Hills, 1998a; Sanders, Constantino, Hsieh, & Rogers, 2007, 2009) and for a 35-year old woman diagnosed with degenerative muscular dystrophy (Sanders & Escobar, 2010). It was unclear as to how and to what extent an adapted version of the program could impact the health and functional mobility of a person with a high degree of disability.

## Andrea's Health History

Andrea is a 27-year-old woman, who lives with her family in Castellón, Spain. She was diagnosed with psychomotor mental disabilities associated with generalized hypotonia (state of low muscle tone) due to peripartal hypoxia (oxygen deprivation occurring during birth). At 21 months of age, Andrea's diagnosis included psychomotor with dysmorphic syndrome (abnormal body shape) and moderate generalized muscle weakness, especially in her trunk and upper body. Let's examine Andrea's health history as she aged:

### 2 Years

Andrea could walk only while holding someone's hand. Without help, Andrea walked only short distances and frequently fell. Along with her physical challenges, Andrea exhibited moderate intellectual disabilities, including cognitive, judgmental, and reasoning impairment.

## 5 Years

Andrea was diagnosed with kyphosis (an abnormal exaggeration of the normal forward curvature of the thoracic spine) and severe scoliosis (abnormal lateral curvature of the vertebral column), which was treated with an orthopedic corset, that was worn 24 hours a day until corrective surgery was scheduled. Andrea also faced limitations in her ability to talk due to severe hypoacusia (diminished auditory sensitivity) and could only speak single words or short sentences. Falling was a constant risk, so all activity had to be supervised for safety.

## 11-12 Years

Surgery was performed using metal fixtures to fuse Andrea's spine, resulting in her ability to stand erect. During the first year after the operation, Andrea could stand straight all day, but over time, the weight of her spinal fixtures began to push her into forward flexion. In the morning, she was erect, but by the afternoon, her trunk began to flex forward. She was not strong enough to overcome the weight of the fixtures designed to remedy the problem. She lost independence as her walking; standing and sitting became difficult or impossible without assistance.

## 16 Years

Five years after back surgery, Andrea participated in land-based physical therapy treatment, which resulted in 5 years of being able to walk alone around the house, get up unassisted from her bed or from a chair, walk outdoors with the support of another person, and climb stairs alone and descend only with assistance.

## 21 Years

Over time, Andrea regressed. At this point, she used a wheel chair to go out of the house because her walking became increasingly slow and difficult. Sleeping was uncomfortable because she could no longer lie supine. After several falls, her situations continued to decline and she complained a great deal about pain in her knees, hips, and back. She could no longer walk around the house alone, although she could still sit down and get up without help. When she stood up from her wheel chair, however, her face winced in pain and she required assistance. Andrea now needed maximal assistance to carry out any activity and suffered daily pain.

## 26 Years

WaterFit® trainers, Charo Belenguer Benitez and Dr. Lourdes Escobar Torres, met with Andrea's mother Rosa, who asked for their help. Although both Charo and Dr. Escobar Torres were trained as instructors, their experience was based on training more healthy individuals; however, they wanted to see if an individualized adaptation of the WaterFit Golden Waves® program could ameliorate some of Andrea's disabilities. In the spirit of team work and with a "can do" attitude, Rosa responded enthusiastically, "Go for it, we have nothing to lose," and Andrea was willing to try. The program was designed so Charo would be the primary trainer and Dr. Escobar Torres would conduct medical supervision and assist with pool exercise design and mobility evaluation.

## Method and Program

### Assessment

Baseline assessments included circumference measures, joint range of motion, measuring both active and passive ranges with a goniometer. Hip flexion was measured in supine from 180°, each leg independently, but due to her fixed forward flexed posture, only post-program assessments could be taken. Body fat was measured as skin fold units, resting heart rate was recorded using a heart rate monitor, and periodic longitudinal video recordings measured changes over time of Andrea's mobility skills and ADLS. An outside evaluation by a licensed psychologist was also included as part of Andrea's progress evaluation.

### Program Design

The original WaterFit Golden Waves® program was designed as a system of movements that provide an individual progression of exercises that target each component of health and land-based activities of daily living (ADL) (Sanders, 2000, 2011; Sanders & Maloney-Hills, 1998b). Water-specific exercises were conducted primarily in warm shallow water, 29–30°C (84–86°F) and tailored to meet the training goals and needs of Andrea. Generally, her program design can be summarized using the FITT principle (Bushman, 2011; Sanders, 2000):

- Frequency: 3 days per week
- Intensity: Moderate
- Time: 30–40 minutes per session
- Type of exercise: Water exercises using the S.W.E.A.T.® system (Sanders, 2000, 2011; Sanders & Maloney-Hills, 1998b) incorporated interval aerobic exercises, muscular power and endurance, flexibility, and water progressions designed to train land-based ADLs. Progression was based on Andrea's response to each day's performance, ability, and pain level. Time-lapse snapshots of Andrea working in the pool can be seen via the DVD links provided.

Program Objectives included having fun and maintaining comfort while targeting

- Cardiovascular endurance
- Muscular endurance and power
- Flexibility, joint elasticity
- Balance
- ADL including agility, sit to stand, walking, balance (static and dynamic), stair climb, and other activities that Andrea wanted to improve (dancing).

## Results

Both quantitative and qualitative outcomes are presented in the following section.

### Physical

Physical changes are summarized in Table 1. Andrea reduced her circumference

**Table 1 Summary of Physical Outcomes**

Measure (Units)	Pretest	Posttest	Change
Blood Pressure (mm Hg)	120/70	120/70	No change
Circumference (Centimeters/inches)			
Arms:			
Right	36.5 cm (14.5 in)	33.5 cm (13 in)	- 3 cm (1 in)
Left	37.5 cm (15 in)	34.5 cm (14 in)	- 3 cm (1 in)
Chest	105 cm (41 in)	102 cm (40 in)	- 3 cm (1 in)
Hip	104.5 cm (41 in)	102.5 cm (40 in)	- 2 cm (.8 in)
Thighs:			
Right	59 cm (23 in)	55.5 cm (22 in)	- 3.5 cm (1.5 in)
Left	58 cm (23 in)	53 cm (21 in)	- 5 cm (2 in)
Calves:			
Right	40 cm (16 in)	37 cm (15 in)	- 3 cm (1 in)
Left	39 cm (15 in)	36 cm (14 in)	- 3 cm (1 in)
Waist	94cm (37in) High risk (Bushman,2011)	92cm (36in) Low risk (Bushman, 2011)	- 2cm (.8 in)
Body Fat (Skin fold units)			
Abdominal	45	35	- 10
Triceps Right	39	32	- 7
Triceps Left	42	32	- 10
Suprailiac	29	23	- 6
Quadriceps	45	40	- 5
Resting Heart Rate (Beats Per Minute, BPM)	80 BPM	74 BPM	- 6 BPM
Joint Range of Motion (Degrees)			
Knee flexion (Right)	95° Active	130° Active	25° Active
	120° Passive	135° Passive	15° Passive
Knee Flexion (Left)	80° Active	115° Active	35° Active
	125° Passive	135° Passive	10° Passive
Trunk extension	Unable to measure due to posture	Unable to measure due to posture	10° Active only, when she walked. Refer to video links.
Hip flexion	Unable to measure due posture	100° Active 115° Passive (Normal)	

limbs through fuller ranges of motion. Range of motion refers to how far a joint can move. Active range of motion measures how far Andrea can move each joint herself, while passive range of motion measures how far someone else can move her joint while she's fully relaxed. Both types of motion improved. At baseline, Andrea was unable to lie on her back (sleeping always on her side), and she sat all day in a wheel chair with hip flexion fixed at 95-105°. Post program, Andrea was in the normal hip and right knee ranges and was able to lie supine so measurements could be taken and she was able to sleep on her back.

## Functional Mobility

Andrea's mobility improved over time increasing her level of activity and social engagement. Let's examine changes over time, from 3–16 months, as she participated in the program:

**By 3 months.** Andrea reported feeling happier with decreased knee and hip pain, although she was still unable to lie supine. She was able to independently rise from and sit down in a chair.

**4 months.** She began to go up and down stairs on her own.

**8 months.** She was able to walk short distances and alone in her home. Sitting in her wheel chair for 4–5 hours, pain free, was now possible, allowing her more freedom to leave her bed and explore new places.

**10 months.** By this time she was independent with her sit to stand skills and could walk around the house unassisted. She moved with more speed and confidence and was able to spend longer hours sitting comfortably in her wheel chair.

**11 months.** She no longer complained of chronic pain and her mood was very good. She was independent around the house and was able to use the bathroom unassisted at night.

**12 months.** Life began to expand as Andrea began to go outside with minimal assistance, even walking short distances.

**16 months.** By now, Andrea was able to cover greater distances with minimal assistance. For 1 month in the summer, she walked from her house to the town's swimming pool and home (1 km) for the first time in many years. She only needed the support of another person for assurance when walking. For mobility over longer distances she continues to use her wheel chair.

## Physical, Emotional and Social Evaluation

Dr María Pons, O.C. Psychologist, Castellón, Spain conducted a post exercise program evaluation on Andrea's behavior, activity level, and mood. Dr. Pons made the following observations:

**Physical.** At the physical level we have seen the following changes:

- Greater assurance and independence in walking without fear. She's able to get up, sit down, to stand better without support, and move with better balance. She no longer asks for assistance when moving around the gym.

Andrea's confidence in her physical abilities has increased. When she walks, and she walks faster.

- Generally, she is more active, cooperative, and communicative. She wants to exercise now. Previously, she stopped and rested, but now she enlarges the water movements for higher intensity work. She also has developed skills to pace herself, so she can balance comfort and work.

**Social and emotional.** Changes in this area include the following:

- Andrea's mood improved and she seems happy and cheerful.
- She now demonstrates more initiative when socializing and is more cooperative.
- She's become more alert and communicative, making more frequent and intentional contact with others. She'll confidently call out to her friends or the staff with a "Hey" or "Look, look" to show them something interesting or to make a comment.
- Andrea has improved her independence. She demonstrates more assurance while walking, standing up from a chair without help and moves with greater ease in familiar spaces.
- Her complaints about pain are not as frequent.
- Overall, Andrea now shows more interest in what is going on around her.



**Figure 1** — Andrea's team: Dr. Lourdes Torres Escobar, Diane Schofield, trainer Charo Belenguer, our "mother of courage" Rosa, and Mary E. Sanders with Andrea.



## Discussion

The purpose of this case study was to determine the impact of a personalized adaptation of the WaterFit Golden Waves® program (Sanders, 2006; Sanders & Maloney-Hills, 1998a) for 16 months, with a woman suffering from a high degree of disability. Under the personal professional leadership of two trainers, one of whom is also a physician, Andrea improved physically, emotionally, and socially.

Physically, she increased active and passive range of motion at the hip, knee, and trunk, which significantly improved her balance during standing and walking. Improvement in trunk extension resulted in healthier skin. Andrea was now able to practice good hygiene by accessing her abdominal skin folds, which resulted in healing of her painful lesions.

Her ability to perform the exercises with increasing speed against water's resistance indicated her improvements in strength that transferred to daily activity. Specific ADL designed exercises and an improvement in general health transferred to improved land-based mobility. Combined increased range of motion and strength may also be responsible for her decreased knee joint pain.

Without special tools, we were unable to weigh Andrea and therefore could not accurately determine body mass index (BMI) scores; however, we estimated that at baseline she would qualify as Class 1 obesity (BMI 30.0-34.9 kg·m<sup>-2</sup>) (Bushman, 2011). Her baseline waist circumference of 94 cm (37 inches) placed her in the risk category "high" for disease. Waist circumference after 16 weeks of the program was 92 cm (36 inches) reducing her risk and placing her into the "low" category for disease. In addition, skin fold measures indicated a healthy reduction of body fat, resulting in reduced load on her joints, while allowing for greater range of motion and ease of movement.

Andrea's resting heart rate started at 80 beats per minute (BPM) and was reduced to 74 BPM by program's end, which indicates an improvement in cardiovascular fitness. During the program, cardiovascular training consisted of high and low intensity intervals, regulated by changing the speed of arm and leg movements and size of the surface area being pushed and pulled through the water.

Most of the training was conducted in shallow water, but a few short deep-water sessions were included. Shallow and deep-water areas were located in separate pools, so it was difficult to transfer between them. Also at 27–28°C (81–82°F) the deep water, compared to the shallow water temperature of 29–30°C (84–86°F), was too cold for long, comfortable workouts. Deep water did provide surrounding resistance where her lungs were fully submerged, increasing the work of breathing. Working in various shallow water depths (navel to nipple), allowed Andrea to ground her feet on the bottom so she could adjust the pressure against her chest for comfortable breathing. She also developed gravity-based skills, by using her feet and hips as a center of balance, which transferred more effectively to land mobility.

Andrea's socialization improved along with her mood, which made her family happy too! Andrea's mother told us how Andrea loves to stay up late dancing with her friends. Her confidence and new mobility have expanded her quality of life and helped to minimize the symptoms of her disability.

## Conclusion

The Water Fit Golden Waves® program (Sanders & Maloney-Hills, 1998a), when adapted to meet individual needs and performed 3 days per week for 30–45 minutes, was shown to improve mobility, body composition, and the quality of life for a woman with severe disabilities. These changes helped to ameliorate limitations and broadened opportunities for Andrea to reach her highest potential to live a social and independent life. Further research is needed to measure the impact of specific water fitness protocols for people who are intellectually and physically disabled.

## Acknowledgment

Our thanks:

- To Andrea for her will power, constancy and tenacity. You were an exemplary student who taught us to eliminate barriers and to start from zero. To witness your progress due to your own efforts and perseverance is our greatest reward.
- To Rosa, Andrea's mother, our "mother – courage." From the first day you offered support and trust, knowing there was no guarantee that this program could help your daughter gain a better quality of life. Thank you for infusing us with your faith in our work, and thank you for always having a beautiful smile for us.
- To Diane Schofield (translator/interpreter) for being our voice, for your professionalism, excellent sense of humor and big heart.

Permission was granted to print Andrea and Rosa's name and to use Andrea's image on video.

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## Digital Video Therapy Sessions on You Tube Links

To view the actual progress of the therapy sessions, please click through to the series of five You Tube links:

- Aquatic Therapy Phase I: <http://goo.gl/DJD5j>  
Aquatic Therapy Phase II: <http://goo.gl/cKaNJ>  
Aquatic Therapy Phase III: <http://goo.gl/UBwom>  
Aquatic Therapy Phase IV: <http://goo.gl/nzWyu>  
Aquatic Therapy Phase V: <http://goo.gl/nFIFs>

## Education Resources

- Aquatic Therapy University: <http://www.aquatic-therapy-university.com>  
Desert Southwest Fitness: [www.DSWFitness.com](http://www.DSWFitness.com)  
National Center on *Health*, Physical Activity, and Disability (NCHPAD) <http://www.ncpad.org>, email: [email@ncpad.org](mailto:email@ncpad.org), 1-800-900-8086.