

**Authors:**

Ida Narulita Dewi\*, Widodo Judarwanto\*\*. Departement of Medicine Rehabilitation  
Ciptomangunkusumo Hospital of Jakarta Indonesia\*, Clinic for Children, Bunda Hospital Jakarta  
Indonesia \*\*\*\*

## I. INTRODUCTION

Autism is a pervasive developmental disorder. This means that most people on the autism spectrum have delays, differences or disorders in many areas -- including gross and fine motor skills. Children on the spectrum may have low muscle tone, or have a tough time with coordination and sports. These issues can interfere with basic day-to-day functioning -- and they're almost certain to interfere with social and physical development.

Children with Autism would rarely be termed physically disabled (though there are some autistic children with very low muscle tone, which may make it difficult to sit or walk for long periods). Most children with autism do, however, have physical limitations.

Aquatic experiences provide unique and essential opportunities for children with autism. A well designed and carefully implemented instructional aquatics program can be instrumental in promoting health and wellness by helping children with autism learn skills that can be used throughout their lifespans (Auxter, Pyfer, & Huettig, 2001; Lepore, Gayle, & Stevens, 1998).

Tony Attwood, an internationally respected expert in the education of learners with disabilities with autism spectrum disorders (ASD), acknowledged the important role of aquatics for children with ASD. Attwood (1998) suggested the ability to swim was less affected in children with ASD than other movement activities. He also suggested swimming can enhance a child's competence and foster an appreciation of proficient movement.

Kito Kitahara, the philosopher and educator who founded and developed Daily Life Therapy, one of the best validated pedagogical approaches for children with autism, acknowledged the importance of aquatics. Kitahara supported aquatics, as a critical part of the Daily Life Therapy curriculum, because it diffused energy and required coordination of hand and leg movements (Kitahara, 1984).

There is considerable documentation of the potential physical, motor, social, and emotional values of a well-designed aquatics program for learners with diverse abilities Broach & Datillo, 1996; Cowart, 1998; Figuera, 1999; Harris, 1995; Hurley & Turner, 1991; Hutzler, Chaman, Bergman, & Sweinberg, 1997, 1998; Killian, Joyce-Petrovich, Menna, & Arena, 1984; Langendorfer, 1986; Langendorfer & Bruya, 1995; Lepore, Gayle, & Stevens, 1998; McBride-Conner, 2001; McHugh, 1995; Peganoff, 1984; Stopka, 2001; Woods, 1992).

Although individuals who teach aquatics to children with autism know inherently aquatics is an effective venue, there is little documented evidence of the effectiveness of aquatic intervention. Cowart (1998) provided case study evidence of the effectiveness of aquatic intervention with hard to reach children whose behavioral characteristics were consistent with educational diagnoses associated with autism spectrum disorders.

The purpose of this article is to describe achievements the role of hydrotherapy in recreational therapy for autism spectrum disease.

## **I. AUTISM SPECTRUM DISEASE**

Autism is a lifelong neurological and biological developmental disability that begins at birth or during the first three years of life. Current prevalence rates indicate an incidence of about 2 in 1000. Although the cause is still unknown, Autism appears to be associated with some hereditary factors. The risk of Autism is three times more likely in males and is not isolated to any one race, culture or socioeconomic group.

The Diagnostic Statistical Manual of Mental Disorders (DSM IV, 1994) places Autistic Disorder under the broader category of Pervasive Developmental Disorders, which includes Autistic Disorder, but also Rett's Disorder, Childhood Disintegrative Disorder, Asperger's Disorder, and PDD not otherwise specified.

Autism may be manifest in infancy as impaired attachment, but it is more often identified in toddlers, mostly boys, from 18 to 30 months of age, in whom parents or pediatricians note an absence or delay of speech development and a lack of normal interest in others or a regression of early speech and sociability.<sup>6</sup> Autistic traits persist into adulthood, but the outcomes of the disorder vary from little speech and poor daily living skills throughout life<sup>7</sup> to the achievement of college degrees and independent functioning.<sup>2,8</sup> Adults with autism may pass as being merely odd or reclusive, or they may be given a diagnosis of obsessive-compulsive disorder, schizoid personality, simple schizophrenia, affective disorder, mental retardation, or brain damage.

The main symptoms of autism<sup>9,10,11</sup> are deficits in sociability, reciprocal verbal and nonverbal communication, and the range of the child's interests and activities. Contrary to popular view, children with autism may be affectionate, but on their terms and without the expected joy and reciprocity. Parents of such toddlers may describe them as independent rather than aloof and may be proud of their supposed self-sufficiency. The inordinate shyness, fearfulness, anxiety, or lability of mood of the child with autism may be replaced by detachment or depression in adolescence. Unprovoked aggressiveness, if not dealt with early, may become a major problem and lead to a need for heavy medication or institutionalization.

No drug or other treatment cures autism, and many patients do not require medication. However, psychotropic drugs that target specific symptoms may help substantially. The effectiveness of methylphenidate in improving attention capacity can be assessed rapidly because of the very short half-life of the drug. With other psychotropic agents, an initial small dose of a single agent should be given; the dosage should be increased sufficiently slowly to gauge effectiveness before any switching of drugs. Serotonergic antidepressants are often prescribed to control stereotypies, perseveration, and mood swings, but controlled trials of these drugs in autism are needed. In view of the potential need for their long-term use, especially to control aggression, medications must not have sedative effects or produce irreversible side effects such as tardive dyskinesia.

The most important intervention in autism is early and intensive remedial education that addresses both behavioral and communication disorders. The effective approaches use a highly

structured environment with intensive individual instruction and a high teacher-to-student ratio. Occupational and physical therapy should address specific deficits. Parents need specific instruction in how to deal with tantrums and destructive behavior and in useful techniques for keeping their children organized and occupied so as to minimize detrimental effects on the family.

## **II. DISABILITY IN AUTISM SPECTRUM DISEASE**

The main symptoms of autism are deficits in sociability, reciprocal verbal and nonverbal communication, and the range of the child's interests and activities. Contrary to popular view, children with autism may be affectionate, but on their terms and without the expected joy and reciprocity. Parents of such toddlers may describe them as independent rather than aloof and may be proud of their supposed self-sufficiency. The inordinate shyness, fearfulness, anxiety, or lability of mood of the child with autism may be replaced by detachment or depression in adolescence. Unprovoked aggressiveness, if not dealt with early, may become a major problem and lead to a need for heavy medication or institutionalization.

Although the lack of a drive to communicate or the withholding of speech has a role in all silent children, young children with autism have actual language disorders as well. Comprehension and the communicative use of speech and gesture are always deficient, at least in young children with autism. A compromised ability to decode the rapid acoustic stimuli that characterize speech results in the most devastating language disorder in autism: verbal auditory agnosia or word deafness.<sup>15</sup> Children with verbal auditory agnosia understand little or no language; they therefore fail to acquire speech and may remain nonverbal.

Less severely affected children, with a mixed receptive—expressive disorder, have better comprehension than expression, which consists of impoverished, poorly articulated, agrammatical, and sparse speech. Other children with autism who speak late may progress rapidly from silence or jargon to fluent, clear, well-formed sentences,<sup>14</sup> but their speech may be literal, repetitive, and noncommunicative and is often marked by striking echolalia or "overlearned scripts." Some of these children speak nonstop to no one in particular in a high-pitched, singsong, or poorly modulated voice and persevere on favorite topics.

Children with Autism often have low muscle tone, self-injurious behavior, and unusual sleeping patterns. Autism is associated with various kinds of neurobiological symptoms, which may include unusual reflexes and high rates of seizure disorder. Children with Autism have significant sensory and perceptual problems, including inconsistent response to sounds. They are very distractible and will over or under react to stimuli. They usually dislike certain textures. They may have a strong sensory need to smell or lick and they have a great deal of trouble screening sounds and processing words.

Young children with autism do not know how to play. They may manipulate or line up toys without apparent awareness of what the toys represent, and they do not engage in pretend play, which, in normal children, starts before the age of two. The observation of what a preschool child does with representational toys is a sensitive and efficient way to detect autistic traits.

Some children with autism have unusually long attention spans during self-initiated activity,<sup>17</sup> although they are virtually incapable of focusing on a joint endeavor with another person.<sup>18</sup> They often have temper tantrums if someone tries to make them switch activities or if a ritual behavior

is interrupted. An inability to concentrate, together with intrusive stereotypies such as hand flapping, may prevent children from engaging in meaningful activity or social interaction. A decreased need for sleep and frequent awakenings during the night are particularly troublesome for parents and care givers.

Approximately 75 percent of persons with autism are mentally retarded; their cognitive level is significantly associated with the severity of their autistic symptoms. Preschool IQ tests do not predict outcome reliably, because some children in effective treatment programs improve significantly. The results of neuropsychological testing typically reveal an uneven cognitive profile, with nonverbal skills generally superior to verbal skills (except in Asperger's syndrome, in which the reverse pattern may exist).<sup>20</sup> Poor insight into what others are thinking persists throughout life. Creativity is usually limited. A small minority of persons with autism have surprisingly good musical, mathematical, or visual-spatial abilities, despite profound deficits in other domains. In cases in which these abilities are astounding, patients with autism may be called savants (formerly idiot savants).

The neurologic substrate of autistic deficits is unknown. In young children, common findings include increased joint laxity and hypotonia, clumsiness, apraxia, and toe walking. Motor stereotypies are often striking and, besides hand flapping, may include pacing, spinning, running in circles, twirling a string, tearing paper, drumming, and flipping light switches, as well as oral stereotypies like humming or incessant questioning. Self-injurious behavior such as biting, head banging, and gouging may be an extremely severe form of stereotypy, which current theory attributes to increased levels of endorphins. In relatively well-functioning adults, childhood stereotypies often persist in an unobtrusive miniaturized form, such as finger rubbing, that may pass unnoticed.

Children with autism may react paradoxically to particular sensory stimuli, being sometimes hypersensitive and sometimes oblivious to certain sounds, tactile stimuli, or pain. They may sniff their food and have an intense dislike of certain tastes or textures. Visual perception is usually superior to auditory perception. Such children may cover their ears and stare with fascination at some visual displays and have an outstanding rote visual or auditory memory.

The lifestyle of children with Autism includes many challenges due to their organizational and sequencing problems. These children don't know where to start, what comes next, or when a task is finished. This creates significant difficulties with organizing their day or their activity involvements.

### **III. THE BASIC PHYSICAL THERAPY IN AUTISM**

Physical therapists (often called "PTs") are trained to work with people to build or rebuild strength, mobility and motor skills. Most physical therapists hold an Associates, Bachelors or Masters Degree in physical therapy, and have worked in the field as an intern before working on their own. They may also be board certified by a national and/or state governing board.

Most physical therapists work in clinical settings and/or home settings, and most work with patients who are recovering from injuries. Many also work with people recovering from stroke. A

subset of physical therapists work with children and adults who are coping with lifelong disabilities such as cerebral palsy, spina bifida, or related neurological disabilities.

Dance and movement therapy, hippotherapy (therapeutic horseback riding), aquatic therapy (therapeutic swimming), recreational therapy and even play therapy may also be offered by people with a background in physical therapy. While none of these specialized services is likely to be supported by medical insurance, many may be right for your child.

Physical therapists may work with very young children on basic motor skills such as sitting, rolling, standing and playing. They may also work with parents to teach them some techniques for helping their child build muscle strength, coordination and skills.

As children grow older, physical therapists are more likely to come to a child's preschool or school. There, they may work on more sophisticated skills such as skipping, kicking, throwing and catching. These skills are not only important for physical development, but also for social engagement in sports, recess and general play.

In school settings, physical therapists may pull children out to work with them one-on-one, or "push in" to typical school settings such as gym class to support children in real-life situations. It's not unusual for a physical therapist to create groups including typical and autistic children to work on the social aspects of physical skills. Physical therapists may also work with special education teachers and aides, gym teachers and parents to provide tools for building social/physical skills.

Most of the time, physical therapy is included in early intervention programs offered by school districts and other local providers. Physical therapists are likely to be subcontracted on an hourly basis. It's also relatively easy to find a physical therapist through local hospitals and rehabilitation centers, though those individuals are less likely to have specific training and experience with autism.

#### **IV. RECREATIONAL THERAPY**

A recreational therapist utilizes a wide range of activity and community based interventions and techniques to improve the physical, cognitive, emotional, social and leisure needs of their clients. Recreational therapists assist clients to develop skills, knowledge and behaviors for daily living and community involvement. The therapist works with the client and their family to incorporate specific interests and community resources into therapy to achieve optimal outcomes that transfer to their real life situation

Recreational therapy embraces a definition of "health" which includes not only the absence of "illness", but extends to enhancement of physical, cognitive, emotional, social and leisure development so individuals may participate fully and independently in chosen life pursuits. The unique feature of recreational therapy that makes it different from other therapies is the use of recreational modalities in the designed intervention strategies. Recreational therapy is extremely individualized to each person, their past, present and future interests and lifestyle. The recreational therapist has a unique perspective regarding the social, cognitive, physical, and leisure needs of the patient. Incorporating client's interests, and the client's family and/or community makes the therapy process meaningful and relevant. Recreational therapists weave

the concept of healthy living into treatment to ensure not only improved functioning, but also to enhance independence and successful involvement in all aspects of life.

Therapeutic recreation specialists use a battery of techniques to incorporate movement with healing and improved fitness for their patients. Aquatic therapy, the use of water to improve physiological and psychological functioning, is often a valuable and enjoyable technique used by therapeutic recreation specialists. Improvements associated with aquatic therapy have been observed for many people with disabilities including individuals with multiple sclerosis, cystic fibrosis, spinal cord injury, arthritis, orthopedic impairments, cerebral palsy, acquired brain injury, ALS, development disability, and autism.

Autism has numerous treatment implications for recreational therapy because of the significant impact on an individual's lifestyle. The main features of Autism include severe delays in language development, inconsistent pattern of sensory responses, uneven patterns of intellectual functioning with peak skills in some areas and significant deficits in others, and marked restriction of activity and interests. Beyond the public perception of Dustin Hoffman's performance in the movie Rain man, most people understand very little about this complex disorder that affects every aspect of an individual's life.

Socially, children with Autism may lack awareness of others, have severe anxiety around others, experience difficulties with reciprocity, and significant difficulties with socialization. A child with Autism will usually lack any kind of a social smile or eye contact. They lack 'normal' responses to people, they may laugh and giggle inappropriately or cry and tantrum easily. They usually have poor play skills, and spend time alone rather than with others. They show little interest in making friends and usually lack the ability to form personal attachments. Often children with Autism lack spontaneous or imaginative play. They do not imitate others' actions and they don't initiate pretend games like other children.

Recreational therapy interventions can help address many of these affected life areas. Recreational therapy can play a primary role in enhancing the quality of life and productivity of a child with Autism. According to the American Therapeutic Recreation Association, Recreational therapists offer individuals with disabilities the opportunity to resume normal life activities and to establish/re-establish skills for successful social integration.

Among the range of interventions that a recreational therapist might choose, one unique and very successful alternative for individuals with autism is aquatic therapy. Water activities provide autistic children with proprioceptive and tactile input. Children with Autism have significant sensory difficulties, and are very distractible. These children over or under react to stimuli in their environment and have very strong reactions to certain textures. The warm water provides a safe and supported environment, which not only supports the children, but also provides them with hydrostatic pressure that surrounds their body in the water. This pressure actually soothes and calms the children, providing the necessary sensory input they crave.

Aquatics activities are a fun and enjoyable experience that have many physical, psycho social, cognitive, and recreational benefits. Research continues to support the concept that water is the ideal medium in which to exercise or rehabilitate the body. Water provides an environment, which reduces body weight by 90%, decreasing stress or impact on the body. Warm water also reduces spasticity and relaxes muscles.



## V. HYDROTHERAPY OR AQUATIC THERAPY

Aquatic Physical Therapy is the evidence-based and skilled practice of physical therapy in an aquatic environment by a physical therapist or by a physical therapist assistant who is under the direction and supervision of a physical therapist. Aquatic Physical Therapy includes but is not limited to treatment, rehabilitation, prevention, health, wellness and fitness of patient/client populations in an aquatic environment with or without the use of assistive, adaptive, orthotic, protective, or supportive devices and equipment.

The buoyancy, support, accommodating resistance and other unique properties of the aquatic environment enhance interventions for patients/clients across the age span with musculoskeletal, neuromuscular, cardiovascular/pulmonary, and integumentary diseases, disorders, or conditions.

Aquatic Physical Therapy interventions are designed to improve or maintain: function. aerobic capacity/endurance conditioning, balance, coordination and agility, body mechanics and postural stabilization, flexibility, gait and locomotion, relaxation, muscle strength, power, and endurance

Interventions used in Aquatic Physical Therapy include, but are not limited to, therapeutic exercise, functional training, manual therapy, breathing strategies, electrotherapeutic modalities, physical agents and mechanical modalities using the properties of water and techniques unique to the aquatic environment

### Water as a Therapeutic Environment

The combination of water's physical properties and the prescribed activity creates a unique environment for many physiological benefits. There are many physical laws of the water that therapists should apply in aquatic therapy. Of them, buoyancy and hydrostatic pressure, are the most important. Archimedes' principle states that when a body is wholly or partially immersed in a fluid at rest, it is acted upon by a buoyant or lift force, equal to the weight of the displaced fluid. It is this buoyancy, applied to activity in the water, that is of such value in physical treatment. Buoyancy can be used in three ways: as assistance, as support and as resistance. In addition an individual has enhanced freedom in the water.

For example, a person who is fully immersed in water experiences approximately a 90% reduction in body weight, thus reducing the impact on the muscular skeletal system often associated with land-based activity. Another property, hydrostatic pressure, supports the body in the upright position with equal water pressure on all aspects of the body. This support enables people who have difficulty walking on land to walk in the water. Although, there are many aspects of water physics that contribute to the therapeutic potential of treatment in the water, hydrostatic pressure, buoyancy and the warmth of the water create an environment that often is more conducive to achieving therapeutic goals than some land-based exercise.

### Water Temperature

Water temperature should be considered when examining the best environment to achieve therapy goals. The literature presents various opinions of the ideal water temperature depending on the disability and the level of activity in the water. Temperatures between 89.6 and 97 degrees

Fahrenheit are most commonly cited as temperatures to achieve relaxation, decreased pain and reduced spasticity. Some professionals suggest that water temperatures above 95 degrees may produce debilitating consequences. To further complicate the water temperature debate, temperatures of 78 up to 86 degrees Fahrenheit have been recommended for individuals with multiple sclerosis who are susceptible to heat-induced fatigue.

Abbreviated Definition of Aquatic Physical Therapy:

Aquatic Physical Therapy is the scientific practice of physical therapy in an aquatic environment by physical therapists and physical therapists assistants. Aquatic Physical Therapy includes but is not limited to treatment, rehabilitation, prevention, health, wellness and fitness of patient/client populations in an aquatic environment. The unique properties of the aquatic environment enhance treatments for patients/clients across the age span with musculoskeletal, neuromuscular, cardiovascular/pulmonary, and integumentary (skin) diseases, disorders, or conditions.

Abbreviated Definition of Aquatic Physical Therapists:

Aquatic Physical Therapists are licensed physical therapists who perform an examination and evaluation to establish a functional diagnosis, prognosis for functional recovery, and need for PT treatment with a plan of care. Aquatic Physical Therapists and Physical Therapist Assistants provide PT treatments in a safe aquatic environment taking into consideration transition to land based functional activities and communication with the patient-care team.

The difference is that aquatic physical therapy requires the “skilled service” of a PT and/or PTA which may include: (a) the clinical reasoning and decision making skills of a PT/PTA; (b) the patient has impairments and/or disabilities which can be minimized or eliminated with aquatic physical therapy; and (c) the patient has potential for reaching new functional goals/outcomes to improve quality of life and ease burden of care

Is aquatic physical therapy effective? This is a rather broad “tell me every thing you know” question. Perhaps volumes could be written on this topic. For information on various topics, please refer to The Aquatic Physical Therapy Bibliography.

Are there particular patients that should or should not have aquatic physical therapy? Indications/contraindications? Indications and contraindications are covered on pages 29 and 30 in “Developing an Aquatic Physical Therapy Program.”

## **VI. ROLE HYDROTHERAPY IN PHYSICAL THERAPY FOR AUTISM**

However, a vigorous therapeutic approach, providing physical and occupational therapy, hydrotherapy, horse riding and music therapy, is recommended as a means of improving functional abilities (1–6).

The role of hydrotherapy are to promote relaxation, improve circulation, restore mobility, strengthen muscles, reeducate walking, improve co-ordination and function and provide recreation



Hydrotherapy promotes balance and helps develop protective responses, as well as giving relief and pleasure to Rett syndrome sufferers (7, 8). In the case described here, the amount of stereotypical movements decreased after hydrotherapy and purposeful hand functions and feeding skills increased. Appropriate intervention strategies using different therapeutic techniques have been described and they are effective in facilitating communication, maintaining hand function and ambulation, preventing deformities and reducing stereotypical hand movements in ASD. The elbow restraint and hand splints are effective in reducing stereotypical movements in children with Autism Spectrum disease (10–13). However, some children with Autism Spectrum Disease react with anxiety during the application of elbow restraints and do not accept the splints. Because hydrotherapy application has a relaxing effect, the girl in that method was calm in the pool and had no stereotypical movements. After hydrotherapy, stereotypical hand movements decreased and purposeful hand functions and feeding skills increased in children with ASD.

## VII. MANAGEMENT RECREATIONAL TREATMENT WITH HYDROTHERAPY

Recreational therapists who choose to add aquatic therapy as an intervention approach for their clients with Autism can realize a great many benefits, but proper planning is essential. The application of hydrotherapy, stereotypical hand movements had decreased and purposeful hand functions and feeding skills increased in this case. Whether hydrotherapy has a positive effect on the functional use of the hand in Autism Spectrum Disease should be investigated using more subjects.

Aquatic therapy has been used for various purposes with children who have additional needs. There has been no specified Aquatic Therapy Program for children with ASD found in my literature search, therefore this author has developed and researched a program for young children between 3-5 years with a diagnosis of Autism Spectrum Disorder. The main aim of the program is to foster interaction and communication between child and parent in a natural setting.

The program ran over ten weeks and was conducted by an Occupational Therapist at a local public swimming pool. Children involved in the program were all receiving Early Intervention Services from Pathways Early Childhood Intervention. Prior to commencement, each family received a home visit to identify individual goals for their children. The weekly pool sessions focused on developing: movement in the water; play skills; communication; independence and consistent routines. Parent interaction and education was central to the program. Various communication aids were introduced to model communication between parents, children and other family members.

Research revealed that the children made gains in 71% of their goals and that the parents were able to identify many areas of benefit for both their children and themselves, ranging from the child demonstrating enhanced communication skills to the parent being able to enjoy an activity with their child. The benefit of this evaluation is that it provides a rationale for the use of Aquatic Therapy as an appropriate Occupational Therapy service provision.

For children with Autism aquatic therapy can focus on therapeutic play-based functional movement, improving range of motion, helping to facilitate neurodevelopmental growth, improved body awareness, increased balance, sensory integration, mobility skills and most importantly, having fun. The Aquatic Therapy and Rehabilitation Institute defines Aquatic Therapy as "The use of water and specifically designed activity by qualified personnel to aid in the restoration, extension, maintenance and quality of function for persons with acute, transient, or chronic

disabilities, syndromes or diseases". Clients with Autism present an interesting opportunity for recreational therapists to use aquatic therapy interventions as part of their overall treatment plan.

Due to their communication difficulties, children with Autism respond better to visual cues and specific tangible rewards. Often using picture cards to explain what you are requesting the child to do will work much better than verbal directions. In an aquatic environment these cards will need to be laminated or somehow waterproofed. Using a digital camera or simply using hand-drawn pictures, the aquatic recreational therapist can place these pictures in a sequence for the child. A simple strip of Velcro on a laminated card can greatly enhance the child's ability to be successful during aquatic therapy interventions.

Another way to ensure a more positive response is to use the 'First, Then' concept. When asking the child to complete a task reinforce the concept of positive consequences using the phrase "first you need to\_\_\_\_, then you can\_\_\_\_". Using rewards is very effective when dealing with children and this also aids in understanding the concepts of time and task completion that children with Autism may have difficulty with.

Children with Autism present significant safety risks when in the pool. Their lack of response to verbal commands, and their distractible nature can present great challenges for even the most careful therapists. It is essential to maintain intense supervision of these clients at all times, particularly in an aquatic environment. Another factor to consider when providing aquatic therapy is the high rate of seizure disorder that is common in children with Autism.

There are many important considerations when choosing aquatic therapy as an option for working with children with Autism. The therapist must evaluate the water temperature and the distractions in the aquatic environment. Because these children are very sensitive to sensory input, the water temperature must be warm and comfortable, or the child will not respond favorably.

Lighting is another important factor. Children with Autism are very sensitive to light and have been known to react poorly to certain types of lighting, especially bright florescent lights. Noise can be an additional factor as most pool environments are noisy.

The instructional program was carefully designed to include a comprehensive pre-participation assessment and on-going evaluation of each swimmer's progress. Potential positive impacts of aquatics programs are maximized if developmentally appropriate assessment and intervention programs are implemented (Gelinas & Reid, 2000; Langendorfer, 1986). This is particularly critical in the early aquatic experiences of a young child with disabilities (Langendorfer & Bruya, 1995). Developmentally appropriate assessment and intervention programs were used throughout. Assessment and subsequent intervention were based on a number of variables including the child's age, experiences in the water, play skills, and interests and needs of the family.

Each swimmer's aquatic skills were assessed initially, and subsequently, using the Texas Woman's University Aquatic Skills Assessment (Huettig, 19981 based on the creative and visionary work of David Armbruster (Armbruster, Alien, & Billingsley, 1968). Armbruster created an instructional swimming program emphasizing the human stroke (dog paddle) as the key movement element leading to acquisition of more sophisticated swimming skills.

Langendorfer and Bruya (1995) suggested the use of developmental aquatic assessment instruments, in and because of their hierarchical structure, may help structure and improve instruction. The TWU curriculum-based assessment instrument addressed a) water adjustment skills; b) flotation skills; c) basic propulsion and breathing skills; d) swimming stroke skills; and e) entry and exit skills. Skills in each of the five categories led, in a hierarchical fashion, to the subsequent acquisition of the next skill. ([www.twu.edu/INSPIRE](http://www.twu.edu/INSPIRE). Select Aquatics.)

The curriculum-based assessment served as the basis for the instructional process. Specific aquatic skills, in each of the five categories, served not only to give the instructor vital information regarding the child's current level of aquatic performance, but also provided the framework for instruction.

Aquatics instruction for each child was carefully designed and based on the student's individual needs, identified through the comprehensive assessment, and systematically monitored in and through individual aquatic education plans. Aquatic lesson plans were carefully prepared and reviewed.

Some study to present a new and challenging model of treatment that combines two therapeutic interventions: hydrotherapy and Snoezelen or controlled multisensory stimulation. The combination of the two therapeutic approaches enhances the treatment effect by utilizing the unique characteristics of each approach. This study believes that this combined model will further enhance each media to the benefit of the clients and create a new intervention approach. This study relates to a hydrotherapy swimming pool facility that has been established at the Williams Island Therapeutic Swimming and Recreation Center, Beit Issie Shapiro, Raanana in Israel, after acquiring many years of experience and gaining substantial knowledge both in the field of hydrotherapy and Snoezelen intervention. Beit Issie Shapiro is a non-profit community organization providing a range of services for children with developmental disabilities and their families. Some study provides hydrotherapy and Snoezelen and presents a case study, which will demonstrate the new model of treatment and show how this new and innovative form of therapy can be used as a successful intervention.

## VIII. HYDROTHERAPY METHODS

Aquatic therapy draws from a broad spectrum of activities and movements, many of which are land-based, but become less rigorous when performed in the water. Various aquatic therapy techniques include: (a) Watsu which applies the movements of Zen Shiatsu to decrease muscle tension, promote self awareness, relaxation and emotional release; (b) stabilization techniques for improving balance, coordination, strength and circulation to joints using the freedom of movement possible in the water; (c) Bad Ragaz which uses the water to provide proprioceptive neuromuscular facilitation patterns rather than using a therapist to provide resistance; and (d) deep or shallow water strength or endurance exercises. Each of these--as well as other methods--require proper training for proper and safe utilization.

The use of swimming as a therapeutic medium is a technical process that requires the combined skills of teaching swimming and water safety, as well as understanding the hydrodynamics of the water and implications and contraindications associated with use of water for therapy. For example the Halliwick Method of instruction applies the principles of hydrodynamics and body mechanics to advance a participant through four phases of skill development: mental adjustment,

rotational control, controlling movement and balancing in the water, and independent movement in the water.

In another example, a professional using the sequential swim method of instruction will apply water properties to specific characteristics of the client's disabilities to enhance physiological and psycho-social functioning, as well as independent water activity. No matter which method is used to achieve independence, each incorporates all muscle groups, enhances proprioceptive skills, and provides neurodevelopmental treatment (which facilitates normal patterns of movement and posture). The potential of swimming to be adopted as a life-long leisure and fitness activity makes it extremely appealing for therapeutic recreation specialists.

## **IX. THE HALLIWICK METHOD**

The Halliwick method was used for the application of hydrotherapy. This method is based on known scientific principles of hydrodynamics and body mechanics, and is divided into 4 phases: adjustment to water; rotations; control of movement in water; and movement in water (8).

The hydrotherapy was applied in a swimming pool twice a week for 8 weeks. The programme was carried out as a one-on-one project with the same physiotherapist. The girl's physical abilities were assessed 3 times: before and 5 minutes after a single hydrotherapy session and after 8 weeks of hydrotherapy. The tests included stereotypical movement analysis, functional hand usage, hand skills, gait and balance, hyperactive behaviour, communication and social interaction. Measurement of the number of stereotypical movements was made from a 5-minute video camera recording. Hand skills consisting of grasping, holding, transferring small and large objects from one point to another, finger feeding and drinking abilities were examined. The girl's functional hand use was assessed according to her performance in eating crackers placed on the table. Picking up a cracker and putting it in her mouth was defined as successful finger feeding.

Before hydrotherapy, the most frequent movement was hand-to-mouth, followed by hand-squeezing movements. Immediately after the hydrotherapy session, hand-to-mouth and handsqueezing movements disappeared, although hand wringing movement appeared. In addition, the amount of stereotypical movements decreased immediately after the hydrotherapy and continued to decrease during the following 8 weeks. Feeding skills and hand skills in transferring objects and holding them for 10 seconds improved following 8 weeks of hydrotherapy. Before the application of hydrotherapy, gait apraxia, trunk ataxia and imbalance were found in the physical assessment. After 8 weeks of hydrotherapy, walking balance improved, interaction with the environment increased and hyperactive behaviour and anxiety decreased.

## **X. CONCLUSION**

The impairments, activity limitations, and participation restrictions seen in children with autism can be wide-ranging and outcomes can be difficult to operationally define and measure. In many study, clinicians identified the areas they perceived as improving as a result of role hydrotherapy

in recreational treatment in Autism . This review could help narrow the field of likely outcomes as a first step toward studies of the effectiveness of hydrotherapy for children with autism.

## XI. REFERENCES

1. Isabelle Rapin. Autism. *The New England Journal of Medicine*. Volume 337:97-104. July 10, 1997:2
2. Gillberg C, Coleman M. *The biology of the autistic syndromes*. 2nd ed. London: Mac Keith Press, 1992.
3. Cohen DJ, Volkmar FR, eds. *Autism and pervasive developmental disorders: a handbook*. New York: John Wiley, 1997.
4. Yilmaz I, Yanarda M, Birkan B, Bumin G. Effects of swimming training on physical fitness and water orientation in autism. *Pediatr Int*. 2004 Oct;46(5):624-6.
5. Chamaillard D, Lavergne JJ. [Swimming pool and therapy]. *Soins Psychiatr*. 1994 Aug-Sep;(166-167):11-3.
6. Perry A, Gillberg C, Hagberg B, Witt-Engerstrom I. Rett syndrome and the autistic disorders. *Neurol Clin* 1990; 8: 659–676.
7. Bumin G, Uyanik M, Yilmaz I, Kayihan H, Topçu M Hydrotherapy for Rett syndrome. *J Rehabil Med*. 2003 Jan;35(1):44-5.
8. Taylor, Francis. Hydrotherapy for Rett syndrome. *J Rehabil Med* 2003; 35: 44–45
9. Dumas H, Francesconi S. Aquatic therapy in pediatrics: annotated bibliography. *Phys Occup Ther Pediatr*. 2001;20(4):63-78.
10. Getz M, Hutzler Y, Vermeer A. Effects of aquatic interventions in children with neuromotor impairments: a systematic review of the literature. *Clin Rehabil*. 2006 Nov;20(11):927-36. review
11. Lipow V. Water-proofing. Measuring aquatic therapy effectiveness. *Rehab Manag*. 1998 Jun-Jul;11(4):34. Review.
12. Getz M, Hutzler Y, Vermeer A. Effects of aquatic interventions in children with neuromotor impairments: A systematic review of the literature. *Clin Rehabil*. 2006;20(11):927-936.
13. Edlich RF, Abidin MR, Becker DG, Pavlovich LJ Jr, Dang MT. Design of hydrotherapy exercise pools. *J Burn Care Rehabil*. 1988 Sep-Oct;9(5):505-9.
14. Jankowski LW. Aquatic therapy. *Respir Ther*. 1976 Jan-Feb;6(1):37-8, 47

15. Darcy S. Vonder Hulls, Lisa K. WalkerJanet M. Powell. [jmpowell@u.washington.edu](mailto:jmpowell@u.washington.edu)Clinicians' Perceptions of the Benefits of Aquatic Therapy for Young Children with Autism A Preliminary Study Physical & Occupational Therapy in Pediatrics: A Quarterly Journal of Developmental Therapy Volume: 26 Issue: 1/2
16. Sarah Daniels, Sylvana Mahmic. Aquatic Therapy Program for Young Children with Autism Spectrum Disorder. Autism Practitioners Conference 2006.
17. Braddock SR, Braddock BA, Graham JM. Rett Syndrome. An update and review for the primary pediatrician. Clin Pediatr 1993; October: 613–626.
18. Hanks SB. The role of therapy in Rett syndrome. Am J Med Genet Suppl 1986; 1: 247–252.
19. Hagberg BA. Rett syndrome: clinical peculiarities, diagnostic approach, and possible cause. Pediatr Neurol 1989; 5: 75–83.
20. McIntosh RM, Simatos D, Weston HJ, Stanley TV. Rett Syndrome: case reports and review. NZ Med J 1990; 103: 122–125.
21. Hanks SB. Motor disabilities in Rett syndrome and physical therapy strategies. Brain Dev 1990; 12: 157–161.
22. Champion MR. Hydrotherapy in paediatrics. In: Champion MR, ed. London: William Heinemann Medical Books Ltd, 1985.
23. Martin J. The Halliwick method. Physiother 1981; 67: 288–291.
24. Hagberg B, Witt-Engerstrom I. Rett syndrome: a suggested staging system for describing impairment profile with increasing age towards adolescence. Am J Med Genet Suppl 1986; 1: 47–59.
25. Budden SS. Management of Rett syndrome: a ten-year experience. Neuropediatrics 1995; 26: 75–77.
26. Ellaway C, Christodoulou J. Rett syndrome: clinical characteristics and recent genetic advances. Disabil Rehabil 2001; 23: 98–106.
27. Naganuma GM, Billingsley FF. Effect of hand splints on stereotypic hand behavior of three girls with Rett syndrome. Phys Ther 1988; 68: 664–671.
28. Bumin G, Uyanik M, Kayihan H, Duğger T, Topçuo M. The effect of hand splints on stereotypic hand behavior in Rett's syndrome. Turk J Pediatr 2002; 44: 25–29
29. Lavie E, Shapiro M, Julius M. Hydrotherapy combined with Snoezelen multi-sensory therapy. Int J Adolesc Med Health. 2005 Jan-Mar;17(1):83-7.
30. Association of Swimming Therapy. (1992). Swimming for People with Disabilities. London: Bedford Row.
31. Campion, M. R. (1990). Adult Hydrotherapy. Oxford: Heinemann Medical Books.
32. Campion, M. R. (1985). Hydrotherapy in Pediatrics. Oxford: Heinemann Medical Books.
33. Carter, M. J., Dolan, M. A., & LeConey, S. (1994). Designing Instructional Swim Programs for Individuals with Disabilities. Reston, VA: AAHPERD.



34. Davis, B. C., & Harrison, R. A. (1988). Hydrotherapy in Practice. New York: Churchill Livingstone.
35. Dull, H. (1993). WATSU: Freeing the Body in Water. Harbin Springs publishing.
36. Jamison, L and Ogden, D. (1993). Aquatic Therapy Using PNF Patterns. Tucson, AZ: Therapy Skill Builders.
37. Skinner, A. T., & Thomson, A. M. (Eds.). (1989). Duffields Exercise in the Water (3rd ed.). Philadelphia: Bailliere Tindall.