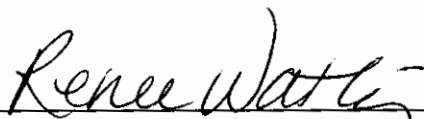


Aquatic Therapy for Children with an Autism Spectrum Disorder:

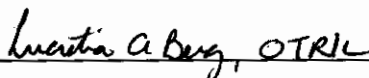
Occupational Therapists' Perspectives

May 2011

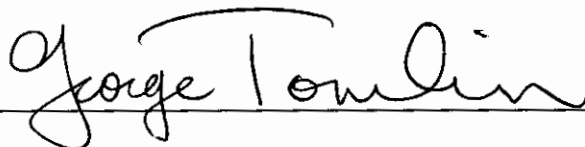
This research, submitted by Maggie Dubois, has been approved and accepted in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy from the University of Puget Sound.



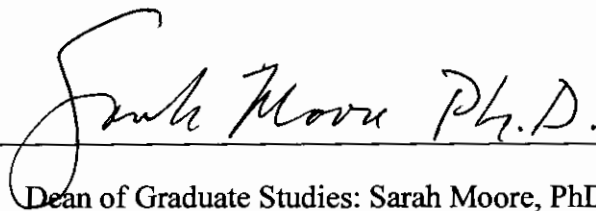
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The Centers for Disease Control and Prevention (CDC, 2010), have recently reported an increase in the number of children diagnosed with an Autism Spectrum Disorder (ASD). It is now estimated that 1 in 110 children in the United States have an ASD (CDC, 2010; Tomchek, LaVesser, & Watling, 2010). Occupational therapists who work with children diagnosed with an ASD focus on building skills in all areas of life such as daily living skills, education, play, and social communication, and in various environments such as school, home, and community (American Occupational Therapy Association [AOTA], 2009). Occupational therapists may use many different methods and interventions to work with children in areas such as daily functions, motor skills, and sensory integration (AOTA, 2008; Autism Speaks, 2009). Currently, occupational therapists working with children who have been diagnosed with an ASD are expanding the use of aquatic therapy (Vonder Hulls, Walker, & Powell, 2006) as a treatment approach within the Occupational Therapy Practice Framework (AOTA, 2008).

To date a multitude of sources such as newspapers, websites, blogs, and word of mouth, claim aquatic activities to be beneficial for children with an ASD. One article on a recreational therapy website stated that hydrostatic pressure “actually soothes and calms the children, providing the necessary sensory input they crave” (Jake, 2003, para. 10). In a local newspaper Downing, a special education teacher, was quoted stating that “swimming is a powerful calming sensory activity and it teaches lots of gross motor skills. For children with disabilities, especially within the autism spectrum, swimming can lead to better communication and better behavior” (Downing, 2011). Occupational therapists, physical therapists, and speech therapists are using aquatics with this population to support therapeutic interventions. Community-based and private programs

provide recreational aquatics classes that are specialized for children with an ASD. The use of aquatics with this population is a reality within society, however there are very few studies that have examined the effects of providing aquatic therapy for children diagnosed with an ASD.

Background

ASD definition and diagnosis. Autism Spectrum Disorder is an umbrella term for diagnoses that include Autistic disorder, Asperger's syndrome, and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) (National Institute of Mental Health [NIMH], 2008; Tomchek et al., 2010). ASD's are neurobiological, developmental disorders that occur within the first three years of life and continue throughout the lifespan (American Psychiatric Association [APA], 2000; Autism Speaks, 2009). Children diagnosed with an ASD may have difficulties in all areas of function, but are particularly challenged with communication, social interaction, behavior, and sensory processing (Case-Smith & Arbesman, 2008; NIMH, 2008). In addition, many may display repetitive behaviors such as flapping or rocking, which are hypothesized by some (Shoener, Kinnealey, & Koenig, 2008) to be responses to the need for increased or decreased sensory input. Children with an ASD may also have motor difficulties and delays (Baranek, 2002; Dawson & Watling, 2000).

Autistic disorder, or autism, is often referred to as 'classic' autism (Tomchek et al., 2010). Children with this disorder typically experience significant sensory processing difficulties and have unusual behaviors and interests (Tomchek et al., 2010). They may have associated impairments such as attention deficit hyperactivity disorder (ADHD), affective disorders, anxiety disorders, inconsistent rates of development, intellectual

impairment, obsessive-compulsive disorders, Tourette's syndrome, and seizures (O'Brien & Daggett, 2006; Rogers, 2010). Impairments may range from mild, also known as 'high-functioning autism', to severe (O'Brien & Daggett, 2006).

Asperger's syndrome is similar to autism, however those diagnosed with Asperger's syndrome typically do not have deficits in communication (O'Brien & Daggett, 2006). In general, Asperger's syndrome is usually milder than autistic disorder, and children do not experience cognitive delays (APA, 2000). Pervasive Development Disorder-Not Otherwise Specified, or atypical autism, is a diagnosis in which children meet some, but not all of the criteria for autistic disorder; usually presenting with fewer and milder impairments (APA, 2000; Tomchek et al., 2010). Most children with PDD-NOS have difficulties with social interactions, however the type and severity of impairments vary (O'Brien & Daggett, 2006).

Symptoms of an ASD. Symptoms of an ASD present differently from child to child. In some cases symptoms may be noticeable from early infancy, such as lack of appropriate eye gaze or joyful expressions (Wetherby et al., 2004). In other cases children may appear to develop typically until 12 to 36 months, then differences become apparent. In the latter case parents may report a 'sudden change' in their child (NIMH, 2008).

Behavior. Early indicators of an ASD include a lack of eye contact with others, deficits in joint attention and pretend play, a lack of interest or engagement with others, and failure to develop relationships with peers (Case-Smith & Arbesman, 2008). Children with an ASD rely on consistency and routines and are often intolerant of change in routines. Even slight deviations may result in intense reactions or tantrums (Rogers,

2010). They often have a persistent, intense, and sometimes obsessive preoccupation with a topic or object. Individuals with an ASD may spend hours lining up specific toys, such as cars, and may get very upset if any toy is moved (NIMH, 2008). Stereotypical behaviors may include deviant motor patterns, such as wiggling, arm flapping, body rocking, and toe walking. Children may not be able to perform two motor tasks at the same time (Rogers, 2010). Children with an ASD may have difficulty regulating their own emotions and can become physically aggressive, lose control, or hurt themselves with behaviors such as head banging or hair pulling (NIMH, 2008).

Communication. Communication in children with an ASD can vary from mild to severe. In mild cases the child may have normal language with slight deficits in tone or articulation. In severe cases the child may have no speech (Rogers, 2010). Early indicators of a possible problem are the lack of babbling, pointing, or gesturing by one year, having no words by 16 months, or not using two or more words in combination by age two years (NIMH, 2008). Language delays and language regression are also common in children with an ASD. Babies may coo and babble in the early months, and then stop. Speech may be delayed until ages 5 to 9 years (NIMH, 2008). Non-verbal communication may also be impaired, body language may be difficult for the child to understand, and facial expressions and gestures may not match the words being spoken or may be delayed (NIMH, 2008; Rogers, 2010).

Social interaction. Children with an ASD often lack reciprocity when interacting with their peers, they do not seek out others to share enjoyment and appear to prefer being alone (Rogers, 2010). Some describe these characteristics as being detached or indifferent. Interacting with peers is challenged due to difficulties interpreting gestures,

social cues, and facial expressions, and difficulty seeing other people's perspectives (Case-Smith & Arbesman, 2008; NIMH, 2008).

Sensory-processing. The interpretation of sensory information from the environment is often problematic for children with an ASD resulting in hyper-responsive patterns, hypo-responsive patterns, or a combination of the two (Case-Smith & Arbesman, 2008; Dickie, Baranek, Schultz, Watson, & McComish, 2009). Hyper-responsiveness to tactile input is a common problem and often elicits anxiety, distractibility, stereotypical behaviors, repetitive behaviors, social withdrawal, and abnormally focused attention (Cheung & Siu, 2009; NIMH, 2008). Generally, individuals with an ASD will enjoy or be calmed by deep pressure, but have difficulty with light touch (NICHCY, 2010). Individuals with an ASD often seek out vestibular input and participate in repetitive movements that provide that input. Repetitive movements commonly seen include swinging, jumping, spinning, being upside-down, climbing, and dancing (Dickie et al., 2009).

In many studies auditory processing impairments are found to be one of the most frequently reported impairments in children with an ASD (Cheung & Siu, 2009). Individuals with auditory sensitivity may have difficulty coping with environmental noises (Dickie et al., 2009; NIMH, 2008; Rogers, 2010). A low sensitivity to pain is also common, and some have hypothesized that self-injurious behaviors are a type of self-stimulation due to this low sensory threshold (Boucher, 2009; Smith, Press, Koenig, & Kinnealey, 2005).

Treatment. There is no cure for diagnoses on the autism spectrum, however, there are many therapies used to treat dysfunctional behaviors, promote development and

increase independence (Autism Society, 2009). Treatments can be broken down into three main categories: behavioral therapy, medications, and therapeutic options, including occupational therapy (Case-Smith & Arbesman, 2008). The goal of behavior management therapy is to reinforce desirable behaviors and decrease undesirable behaviors (NICHCY, 2010). Medications are often used to treat some of the more severe behavioral or medical problems such as aggression, anxiety and depression, behavior problems, inattention and hyperactivity, and seizures (NICHCY, 2010). Occupational therapy can help to adjust tasks and activities to the needs and abilities of the individual (NICHCY, 2010). No single treatment will be effective for all individuals with an ASD, however studies indicate that most will respond best to highly structured, specialized programs (NIMH, 2008; Rogers, 2010).

What is occupational therapy? Occupational therapists provide therapeutic services through interventions that “support health and participation in life through engagement in occupation” (AOTA, 2008, p. 626). Occupations refer to everyday activities that are meaningful and contribute to the health and well-being of the individual. Occupational therapists consider multiple areas of occupation, including activities of daily living (ADLs) such as bathing, dressing, and eating, and instrumental activities of daily living (IADLs) such as care of others and the home, rest and sleep, education, work, play and leisure (AOTA, 2008). In occupational therapy the therapist and client work together to design services that match the individual’s needs and goals for therapy.

Occupational therapy for an ASD. Occupational therapy services are provided for children with an ASD in order to assist them in engaging in daily life activities that

are meaningful and purposeful (AOTA, 2009). A study conducted by the Interactive Autism Network (IAN, 2008) reports that occupational therapy is the second most frequent service provided for persons with autism in the United States.

With no cure, treatments and therapies must address a wide range of functional problems in various areas of occupation for the client. Studies indicate that clients with an ASD may have difficulties with ADLs, IADLs, sleep, play, leisure, and social participation. Occupational therapists design interventions that address goals within these areas (Baranek, 2002; Dawson & Watling, 2000). To do this occupational therapists must be creative and use modalities that are meaningful, engaging, and therapeutic with their clients.

Aquatic therapy. Aquatic therapy is defined as a “therapeutic procedure which attempts to improve function through the application of aquatic therapeutic exercise” (Salzman, 2009, Point #1 section, para. 1). Salzman (2009) defines therapeutic procedure as the use of clinical skills or services to improve function, and specifies that the occupational therapist must be directly supervising the client during the activity.

Water properties of buoyancy, hydrostatic pressure, and thermodynamics have been credited with aiding the effectiveness of therapies in the aquatic environment (Becker, 2009; Broach & Dattilo, 1996; Dale, MacDonald, & Messer, 2005). Buoyancy helps to reduce the load of body weight and can be used to assist, support, or to provide resistance. (Becker, 2009; Broach & Dattilo, 1996). Hydrostatic pressure exerts an equal and consistent amount of pressure on all submerged parts of the body, and provides resistance to help increase muscle strength and aerobic capacity without overstressing soft tissue (Fragala-Pinkham, Haley, & O’Neil, 2008; Getz, Hutzler, & Vermeer, 2006).

Thermodynamics refers to the temperature of the water, which is most often recognized to have therapeutic benefits of relaxation, decreased pain and reduction in tone (Becker, 2009).

Aquatic therapy can help to restore, extend, or maintain function for persons with chronic disabilities, or syndromes (Jake, 2003). Populations that can benefit from this therapy may include individuals that have problems with sensory processing or regulation, and de-conditioning as a result of diagnoses such as developmental delay, autism, and others (Broach & Dattilo, 1996; Dale et al., 2005).

The use of aquatic activities have been known to produce physiological benefits such as strength, coordination, range of motion, perceptual and spatial awareness, muscular and cardiovascular endurance and relaxation (Broach & Dattilo, 1996). The psychological benefits of aquatic activities include improved mood, self esteem and body image, and decreased anxiety (Broach & Dattilo, 1996; Vonder Hulls et al., 2006). Other benefits credited to aquatic activities are language development, decreases in problem behaviors, and improved ability to modulate sensory input (Vonder Hulls et al., 2006).

How aquatic therapy can help children with an ASD. The use of aquatic therapy for intervention in treatment for diagnoses on the autism spectrum is relatively new and currently there is only a small amount of research on the topic. Vonder Hulls and colleagues (2006) conducted a survey of 18 occupational therapists in the United States who provided aquatic therapy to children ages 4 to 10 with an ASD. Therapists reported increases in swim skills, attention, muscle strength, balance, touch tolerance, initiation and maintenance of eye contact, and water safety.

In a recent study, Pan (2010) conducted an experiment to determine the effectiveness of a water exercise swimming program on the aquatic skills and social behaviors of 16 boys with high functioning autism and Asperger's syndrome. The results indicated a significant improvement in swim skills and a decrease in antisocial behaviors such as self-stimulatory behaviors. In a qualitative component parents reported improvements in their child's self-confidence, social, and athletic performances.

In a case study Yilmaz, Yanardağ, Birkan, & Bumin (2004) examined the effects of a swim program on the functionality of motor skills and acquisition of water orientation skills in a child with autism. They found that swimming was an effective approach to physical fitness, further contributed to motor development, and helped to increase water orientation in the child.

These were the only studies found in a literature review spanning the past 30 years that examined the use of aquatics for children with the specific diagnosis of an ASD. In two earlier analyses, Best & Jones (1974) and Jones & Best (1975) used movement therapy, which included swimming, with four children with autism, to examine the effectiveness of a physical activity program. The publications used the same data from one experiment to conduct two separate analyses. Results of the first analysis (1974) concluded that a physical activity program, such as swimming, may contribute to a child's total growth. The second analysis (1975), reported improvements in social, cognitive, motor, and behavioral development.

In an unpublished study in 2008 Ennis and colleagues (as cited in DavisPT Network, 2009) conducted a pilot study of the effects of an aquatic therapy program for young children ages 3 to 7, with an ASD. Ennis reported that the analysis of the data

collected did not show any statistically significant improvement on standardized tests. Qualitative data reported an increase in eye contact, verbal responses and improvements in motor skills.

There are also many anecdotal reports of the positive benefits of aquatic therapy in the lives of those with an ASD. Among these are increased physical or behavioral skills, strength, endurance, and opportunity for life skills practice (Jordan, 2009); increased self-confidence and social participation (Oram, 2009); and reports that the water calmed children and improved body awareness (Jake, 2003).

Occupational therapy and aquatics. Aquatic therapy is a therapeutic procedure or intervention technique that is within the occupational therapy scope of practice (Salzman, 2009). In order to provide aquatic therapy occupational therapists currently do not need any specialized aquatic certification or training beyond what is required for licensure within the profession (Salzman, 2009). Activities in the water can be applied across a wide variety of contexts and can cater to individual client factors and activity demands. Occupational therapists can use the aquatic environment to focus on sensory processing, sensorimotor performance, social behavioral performance, self-care, and participation in play, to gain benefits from the properties of water.

As the reported incidence of ASD in children continues to increase, there is a greater need for therapy options that are guided by evidence to address the functional limitations that children with an ASD typically encounter (Case-Smith & Arbesman, 2008). In order to understand the effects of aquatic therapy for children with an ASD, more research is needed to explore how clinicians in the field are already using aquatics in treatment, and the outcomes being observed. The purpose of this study was to provide

preliminary information about occupational therapy practitioners who used aquatic therapy for children with an ASD, how they used aquatics for this population, and the outcomes they observed.

Method

Research design

This descriptive study used a survey to meet the aims of this project. According to Portney and Watkins (2009), a survey allows the researcher to collect data about a specific treatment method and the characteristics of that method.

Participants

The population for this study was occupational therapists within the United States who used aquatics therapeutically for children with an ASD ages 3 to 18. The following inclusion criteria were used: (a) the occupational therapist was licensed or registered; (b) the occupational therapist was practicing within the United States; (c) the occupational therapist used aquatics during treatment; (d) the children being treated were ages 3 to 18; and (e) the children being treated had a primary diagnosis of Asperger's syndrome, Autistic disorder, or Pervasive Development Disorder-Not Otherwise Specified (PDD-NOS). Exclusion criteria included (a) professionals who were not occupational therapists, (b) occupational therapists who were not providing aquatic therapy for children who had been diagnosed with an ASD, and (c) occupational therapists who were not using aquatics either as a treatment goal or to make progress toward treatment goals.

A purposive sample procedure was used to locate participants using the internet as a resource. A Google search was conducted using the terms *ASD*, *aquatic therapy*, *autism*, *children*, and *occupational therapy*. Each link that included occupational

therapy, autism, autism spectrum disorder, or aquatic therapy in the summary was explored for information about the inclusion and exclusion criteria. Contact information including facility name, address, and name of supervisor if available, for each facility that met the inclusion criteria was compiled into two category lists.

The Category I list consisted of 23 facilities in the United States whose website specifically stated that the facility provided occupational therapy services to children with an ASD, and specifically stated that occupational therapists used aquatic therapy. The facility did not need to specify which diagnoses occupational therapists used aquatic therapy for in treatment. The Category II list consisted of 27 facilities in the United States whose websites specified that they provided occupational therapy services to children with an ASD, and that the facilities offered aquatic therapy. These websites did not specify that occupational therapists used aquatic therapy. The Category II list also included sites that did not specify the use of aquatic therapy, but had staff biographies that described interest, training, or experience in aquatic therapy. The criteria for each list are shown in Table 1.

Instrumentation

A unique questionnaire was created based upon a literature review and consultation with two pediatric occupational therapists with research experience who work with children diagnosed with autism, one of whom is an expert in the field. The questionnaire was reviewed by these individuals to determine face and content validity. The questionnaire was piloted by one entry level occupational therapist who had used the water in treatment for children diagnosed with autism. The questionnaire was then revised based upon feedback.

The questionnaire had three sections: demographics, current use of aquatics in treatment, and observed outcomes/effects. The demographic section included questions about practice setting, experience, and case load. The current use section included questions about the types of treatment goals addressed with aquatic therapy and the aquatic environment that was used in therapy. The outcomes/effects section included changes observed or reported by parents after incorporating aquatic therapy into treatment. Refer to Appendix A to view the questionnaire.

Procedure

The researcher gained Institutional Review Board approval from the University of Puget Sound. Cover sheets for the first and second mailings that described the study and specified that the return of the questionnaire implied the participant's informed consent were drafted. These are located in Appendix B.

The survey was implemented using the procedures outlined by Salant and Dillman (1994). The questionnaire, cover sheet, and a stamped and addressed return envelope were compiled into survey packets and mailed to all 50 facilities on the Category I and Category II lists. Return envelopes were marked with a numeric code to ensure confidentiality while allowing for the tracking of non-respondents, so that a follow-up mailing could be sent. Two weeks after the initial mailing, non-respondents were mailed a follow-up survey packet including a cover letter, questionnaire, and stamped, addressed return envelope. A cut-off date for accepting returned questionnaires was established at four weeks after the second mailing date to ensure sufficient time to complete the project within the primary researcher's availability.

Data Analysis

Data obtained through forced choice and written-in responses were coded and analyzed quantitatively using the Statistical Package for the Social Sciences (Version 14.0), and compared using descriptive statistics, frequencies, and percentages.

Results

Out of 50 mailed questionnaires, a total of 21 were returned, representing a response rate of 42%. Thirteen of the returned questionnaires met the criteria for inclusion in data analysis. Of the eight questionnaires that did not meet the criteria, seven respondents had not provided aquatic therapy for children with an ASD in the past month, and one respondent did not provide occupational therapy services for children with an ASD.

Respondent profile. Respondents were asked to report years of experience providing occupational therapy to pediatric clients. One respondent marked the question incorrectly, and a clear answer could not be determined, thus the response was omitted from analysis. Of 12 responses to the question, four respondents reported two or less years of experience, two reported 6 to 10 years, two reported 11 to 15 years, and four reported more than 15 years. Responses regarding experience providing services to children with an ASD were similar. Four of 12 respondents reported two or less years of experience, one reported 3 to 5 years, two reported 6 to 10 years, two reported 11 to 15 years, and three reported more than 15 years. Respondents reported having the following certifications: aquatic exercise (2), ATRI pediatric aquatic certification (2), lifeguard certification (2), Proprioceptive Neuromuscular Facilitation (PNF) (3), and Watsu (3). Five reported having no additional training in aquatics.

Caseload and client profile. The majority (54%) worked full time at 40 or more hours per week. Thirty-eight percent of respondents worked between 30 and 39 hours per week. Nine of the respondents worked in an outpatient clinic, one worked in the community, one at a hospital, and one worked at both inpatient and outpatient clinics. Respondents varied in the number of children they typically treated per week, responses ranged from 3 to 45 children. The group mean was 28 children treated per week. The range of children with an ASD treated per week was 1 to 28, with a mean of nine children. The number of children with an ASD for whom occupational therapists used aquatic therapy ranged from 1 to 20 children per week, with a mean of four and a mode of two children. On average, respondents reported using aquatic therapy in treatment for 44% of their ASD caseload. For those children with an ASD that respondents did use aquatic therapy with, 46% reported that they sometimes used aquatic therapy, 31% frequently used it, and 23% always used it. Respondents were asked to report the ages of the children with an ASD for whom they used aquatic therapy. Sixty one percent reported using aquatic therapy for ages 3 to 5 years, 46% used it for ages 6 to 8, 38% used aquatic therapy for ages 9 to 12 years, 6% used aquatic therapy for ages 13 to 15 years, and 6% used aquatic therapy for clients 16 to 18 years old.

Practice patterns. When using aquatic therapy with children with an ASD, 77% of respondents reported always having a one to one ratio with the client. Ninety percent of respondents reported that they never used a ratio of one to two, 77% never used a group of three to five clients, and 85% never used aquatic therapy for a group of six or more. In response to a “select all” forced choice question about why they believed water to be a useful therapy tool the following was reported: 100% of respondents cited

proprioceptive input received from hydrostatic pressure, 77% cited buoyancy for both assisting movement and increasing strength, and 85% replied that movement through water helped to increase spatial awareness. Sixty nine percent of respondents cited that movement through water helped to increase coordination, 62% reported that thermodynamic properties aided relaxation, and 69% reported that clients thought water play was fun. Twenty three percent of respondents cited that water served as a distraction, 31% felt that the use of aquatics provided respiratory support, and 15% cited water as a useful tool for self-regulation and meaningful practice of ADL's.

Respondents were asked to report all of the goals which they addressed when they used aquatic therapy in practice for children with an ASD. One hundred percent of respondents reported using aquatics to address primary therapy goals, 31% used aquatics as a distraction, 31% used aquatics to teach water safety, 23% used aquatics as a reward. Respondents were asked the frequency at which they used aquatic therapy for specific goal areas. The top four goal areas reported as always addressed by respondents included sensory processing (85%), attention (54%), gross motor (54%), and arousal (46%). Refer to Table 2 for specific results.

Respondents were then asked to rank the top three goals that they always addressed. Fifty percent of respondents identified sensory processing and 30% identified arousal as their most frequently addressed goal. The second more frequently addressed goals were sensory processing (30%), attention (20%), and gross motor (20%). The third most frequently addressed goals were attention (33%), and social interaction (22%).

Outcomes. Respondents reported the type of effects they observed aquatic intervention to have on several areas, as well as the effects parents had reported to them

in the same areas. The majority of respondents reported positive changes in general affect, motor skills, social skills, swimming skills, and comfort in the water. Results can be seen in Table 3.

Discussion

Evidence from both the literature and previous studies have credited aquatic therapy with having multiple benefits for individuals with ASDs. Results from this study revealed the practice patterns of occupational therapists who are using aquatic therapy in practice with children with ASDs, and the benefits they report observing among this population.

Respondent profile. This study attempted to provide insight into the population of occupational therapists who were using aquatic therapy for children with an ASD. Neither years of experience in pediatrics nor years of experience with children with an ASD seemed to have an impact on the use of aquatic therapy by the participants in this study. This suggests that the amount of experience an occupational therapist has in working with children with ASDs may not be a factor in frequency of using aquatics for this population. However, it is not known if the sample was representative of the actual population of clinicians who are using aquatic therapy in treatment with children with an ASD due to difficulty in locating the sample.

The proportion of respondents reporting certifications suggests that occupational therapy practitioners may find additional training to be valuable in providing this treatment option. This study did not provide any information about how often the skills or specialized methods obtained from additional certifications are used during aquatic

therapy treatment sessions with this population. Therefore the value of extra training cannot be quantified.

Caseload and client profile. Schedules among respondents suggested that the amount of hours an occupational therapist works is not a significant factor in the use of aquatic therapy. The report that such a high proportion of respondents were able to successfully incorporate aquatic therapy into their work week suggests that factors such as transition time in and out of the water, time needed to change in and out of swim wear, and transportation time to the pool if it is not on site can be successfully managed in order to incorporate use of aquatics into occupational therapy services.

The small proportion of respondents who reported using aquatic therapy with children with an ASD suggests that there may be other factors that affect the decision to use this treatment. Among these may be limited experience or confidence in the water, limited availability of pool time, productivity demands, restricted time for transitions, or unwillingness of the client or parent to use aquatics.

A small percentage of respondents reported always using aquatic therapy. It is not known if they were using this as a stand-alone treatment method, or as an adjunct to land-based treatments. More research is needed to guide occupational therapists in critically analyzing the appropriateness of aquatic therapy for each client. The frequency that aquatic therapy was reported as used with young children suggests that there may be unknown underlying factors that make aquatic therapy more applicable or more effective for younger ages. It may be that more children qualify for occupational therapy services at younger ages, or that the focus of interventions is different between younger and older children.

Practice patterns. Respondents reports of using aquatic therapy in a one to one treatment ratio nearly all of the time suggests that direct therapist/client interaction in the water may be a valuable aspect of the intervention. It is possible that the one to one ratio may be useful in addressing communication or other social interaction goals. It is also possible that a one to one ratio is important due to the behavior and attention challenges common among children with autism and subsequent safety concerns, or that this ratio is mandated by those agencies providing payment for services.

The congruence between the use of water to provide proprioceptive input, use of the water to address sensory goals, and observed improvements in sensory processing abilities suggest that occupational therapists believe that water can provide therapeutic sensory benefits. This is consistent with reports in the published literature and anecdotal resources that aquatics can support sensory modulation. In fact, hydrostatic pressure has been specifically cited by multiple sources to provide proprioceptive input, which helped with sensory processing, calming, and regulation.

Many of the goal areas for which respondents reported using aquatic therapy are similar to those identified in previous research (Pan, 2010; Vonder Hulls et al., 2006; Yilmaz et al., 2004). The use of aquatics to address attention, general development, social interaction, and water safety is consistent with the report of Vonder Hulls et al. (2006) of increases in attention, muscle strength, balance, eye contact, and water safety. Goals related to swimming skills and general development are consistent with the research from Pan (2010) and Yilmaz et al. (2004), whose studies reported improvement in those areas. These recurring reports support the use of aquatics to address treatment goals in those areas.

Outcomes. The findings from this study suggest that clinicians are observing multiple benefits from the use of aquatic therapy for children with an ASD in many areas of function, which provides support for the use of aquatic therapy as an effective treatment option. Results of increased swim skills, motor skills, social skills, and water safety, as well as decreases in sensitivity to sensory stimuli are similar to the findings of Vonder Hulls et al. (2006). An increase in swim skills and decline in stereotypic behaviors mirrored results of Pan (2010) and Yilmaz et al. (2004) who both reported increases in motor skills as an outcome of aquatic therapy. The information from this study supports the results of the few previous studies to date, and provides evidence of improvements in other areas, such as positive affect, self-regulation, and respiratory skills. Being in the water may provide benefits that are not as easily obtained in land-based activities. The provision of proprioceptive input to the entire submerged surface of the body, while still allowing activity and movement through the water, may work to support the child's ability to attend while increasing gross motor development and coordination.

Limitations

Several factors could be considered limitations to this study. The method of obtaining study participants may make the study difficult to replicate due to challenges with finding the population of occupational therapists who were using aquatic therapy for children with an ASD. The short period of data collection may have reduced the response rate. The questionnaire responses indicated confusion in how to answer some questions and may have affected the results. Also, respondents were asked to report reactions from parents, making them a secondary and less reliable source which may

affect the credibility of those responses of parent outcomes. Finally, the ability to generalize results is limited due to the lower than desired response rate.

Implications for OT

The results of the current study indicated that occupational therapists with access to a swimming pool used aquatic therapy to provide treatment that addressed multiple goals and skill areas for children with an ASD, and reported observations supporting effectiveness. The results of this study were consistent with those of previous studies that aquatic therapy can be an effective treatment method for this population, and contributes to ability of clinicians to use evidence-based practice to provide aquatic therapy. This study also identified a potential area to extend practice by informing occupational therapists and other health professionals about the use of aquatic therapy for children with an ASD, and may in the future contribute to an evidence-base that supports funding of aquatic therapy from private insurance companies.

Implications for future research

This study provided preliminary information about occupational therapists who are already using aquatic therapy in treatment. Future research should seek to increase the number of participants to increase generalizability of outcomes. An experimental design comparing the use of aquatic therapy with land-based techniques to achieve similar goals would be helpful in comparing aquatic therapy methods with more traditional practice. Studies examining the efficacy of aquatic therapy for children with an ASD specifically would also be valuable to the field of occupational therapy. In general more studies with increased number of participants are needed in order to better understand the potential benefits of using aquatic therapy for children with an ASD.

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Table 1

Criteria from facility websites that was used to create Category lists

Criteria	Category I	Category II
Facility provided occupational therapy service for children with an ASD	23	27
Facility provided aquatic therapy	23	27
Occupational therapists provided aquatic therapy	23	----
Occupational therapist staff biographies reflected interest/experience in aquatic therapy	----	3

Note. Table total exceeds 50 due to some facilities meeting multiple criteria.

Table 2

Frequency of specific goal areas respondents reported addressing during aquatic therapy

Goal Area	Never	Occasionally	Frequently	Always
ADL's	8%	39%	15%	31%
Attention	--	--	46%	54%
Arousal	--	15%	39%	46%
Behavior (stereotypic)	--	23%	46%	23%
Communication skills	--	23%	46%	31%
Emotional Regulation	--	15%	53%	31%
Fine motor	--	53%	31%	15%
General development	--	23%	53%	15%
Gross motor	--	8%	39%	54%
Play	--	15%	46%	31%
Sensory processing	--	--	15%	85%
Social interaction	8%	8%	62%	15%
Self-injurious behavior	23%	46%	15%	--
Swimming/water safety	--	46%	31%	23%
Visual motor	8%	46%	15%	31%
Visual perception	8%	54%	15%	23%

Note. Totals may not equal 100% due to respondents leaving some portions blank.

Table 3

Effects of aquatic therapy observed by occupational therapists and reported to occupational therapists by parents

Effects	Frequently decreased		Occasionally decreased		No change		Occasionally increased		Frequently increased	
	OT	Parent	OT	Parent	OT	Parent	OT	Parent	OT	Parent
General positive mood	-----	-----	-----	-----	-----	-----	23%	23%	77%	77%
Motor skills	-----	-----	-----	-----	-----	-----	46%	31%	54%	62%
Sensitivity to sensory stimuli	39%	31%	23%	23%	-----	-----	-----	8%	39%	39%
Social skills	-----	-----	-----	-----	8%	23%	31%	31%	54%	39%
Stereotypic behaviors	23%	8%	31%	23%	8%	23%	23%	15%	8%	15%
Swimming skills	-----	-----	-----	8%	15%	8%	62%	23%	23%	54%
Comfort in water	-----	-----	-----	-----	8%	8%	15%	15%	77%	69%

Note. Occupational therapists provided secondary report of parent observations.

Appendix A

**The Therapeutic Use of Aquatics for Children
with an Autism Spectrum Disorder:
Occupational Therapy Perspectives (2011)**



Please return your completed questionnaire in the enclosed envelope to:

School of Occupational Therapy

University of Puget Sound

1500 N. Warner St.

Tacoma, WA 9841

Qualifications for Participation

We would like to know a little about you in order to determine if you fit the criteria for participation in this study.

1) Are you currently (**Please mark all that apply**):

- Practicing as an occupational therapist
- Licensed to practice in your state of residence (if licensure is required)
- Registered with NBCOT
- None of the above

2) Are you currently working with children ages 3-18 with an autism spectrum disorder (PDD, autism, Asperger's disorder, PDD-NOS)?

- Yes
- No

3) Have you used aquatics for interventions with children with an ASD in the last month?

- Yes
- No

******If you answered *No* or *None of the above* to any of the previous questions, please stop answering questions and use the return envelope to mail the survey back at this time. Thank you for your participation******

Section I: Background

4) How many years of experience do you have in providing occupational therapy to

the following groups:

Pediatric clients:

Less than 1 year

1-2 years

3-5 years

5-10 years

10-15 years

More than 15 years

Clients with an ASD:

Less than 1 year

1-2 years

3-5 years

6-10 years

11-15 years

More than 15 years

5) Please mark the primary setting in which you currently work. **(Select only 1)**

Child's home

Community

Hospital

Outpatient clinic

Rehabilitation center

School

Other _____

6) Please indicate the number of hours you regularly work per week.

_____ Hours per week

7) Please indicate the total number of children you regularly provide occupational therapy services for per week.

_____ Children per week

8) Please indicate the total number of children with an ASD that you regularly provide occupational therapy services for per week.

_____ Children per week

- 9) How many children with an ASD do you regularly provide occupational therapy services for using aquatics per week?

_____ Children per week

- 10) Of the children with an ASD that you regularly provide intervention for, with what frequency do you use aquatics in their intervention? **(Please circle)**

Never Sometimes Frequently Always

- 11) Of the children with an ASD that you use aquatics with, how many fall into each of the following age groups:

_____ 3-5 years old
 _____ 6-8 years old
 _____ 9-12 years old
 _____ 13-15 years old
 _____ 16-18 years old

- 12) Please mark any aquatic certifications or training that you have.

_____ Adapted aquatic instructor
 _____ Aquatic therapeutic exercise
 _____ Aquatic Proprioceptive Neuromuscular Facilitation (PNF)
 _____ Watsu
 _____ Other _____
 _____ Other _____
 _____ Other _____
 _____ No additional training

Section II: Current use of Aquatics for Intervention

- 13) In general, how do you currently use aquatics in your practice with children with an ASD? **(Please mark all that apply)**

_____ To address primary therapy goals
 _____ As a distraction
 _____ To teach water safety
 _____ As a reward
 _____ Other _____

14) Rate the frequency at which you provide aquatic intervention in each format for children ages 3-18 with an ASD.

	Never	Occasional ly	Frequently	Always
1:1 (one on one)	0	1	2	3
1:2 (one to two)	0	1	2	3
Small Group (3-5)	0	1	2	3
Larger Group (6 or more)	0	1	2	3
Other _____	0	1	2	3

15) As a clinician using aquatics for intervention, why do you believe water to be a useful therapy tool? **(Please mark all that apply)**

- A.** Being in the water serves as a distraction
- B.** Buoyancy provides support and assists movement
- C.** Buoyancy provides resistance to increase muscle strength
- D.** Clients think water play is fun
- E.** Hydrostatic pressure provides full body proprioceptive input
- F.** Movement through water helps to increase coordination
- G.** Movement through water helps to increase spatial awareness
- H.** Thermodynamic properties aid relaxation
- I.**

Other _____

J.

Other _____

K.

Other _____

16) Of the choices you have marked in question 13, please write in the top 3 reasons that you believe water to be the most useful as a therapy tool.

- 1) _____
- 2) _____
- 3) _____

17) Please reflect upon the therapeutic goals of ALL of the clients with an ASD for whom you use aquatics. With these goals in mind, please rate the frequency with which each of the following areas are targeted through your use of aquatics.

	Never	Occasionally	Frequently	Always
Activities of Daily Living	0	1	2	3
Attention	0	1	2	3
Arousal	0	1	2	3
Behavior (stereotypic)	0	1	2	3
Communication Skills	0	1	2	3
Emotional regulation	0	1	2	3
Fine Motor	0	1	2	3
General Development (reflexes, tone)	0	1	2	3
Gross motor	0	1	2	3
Play	0	1	2	3
Sensory Processing	0	1	2	3
Social Interaction	0	1	2	3
Self-injurious behavior	0	1	2	2
Swimming/water safety	0	1	2	3
Visual motor	0	1	2	3
Visual perception	0	1	2	3

Other _____	0	1	2	3
Other _____	0	1	2	3

18) Of the skill areas identified as "Always" in question 15, please write in the top 3 areas for which you believe aquatics to be most effective for children with an ASD.

1. _____
2. _____
3. _____

19) Please mark the type of pool you primarily use for aquatic interventions.

- Private pool owned by a hospital/clinic
- Private pool owned by other (please specify) _____
- Public pool
- Therapy pool (water temp. at least 85 degrees)
- Swimming pool (water temp. below 85 degrees)

20) For the pool identified in question 19, do other activities occur in the pool at the same time as you are providing aquatic intervention?

- Yes
- Sometimes
- No

21) For the pool identified in question 19, please rate the frequency and number of other people typically in the pool area at the time of intervention.

	Never	Occasionally	Frequently	Always
1 to 2 people	0	1	2	3

3 to 4 people	0	1	2	3
5 to 8 people	0	1	2	3
9 to 15 people	0	1	2	3
More than 15 people	0	1	2	3

	Frequently decreases	Occasionall y decreases	No change	Occasionall y increases	Frequently increases
--	---------------------------------	------------------------------------	------------------	------------------------------------	---------------------------------

Section III: Effects and Outcomes

22) Please indicate the type of effect **YOU** observe aquatic intervention to have on each of the following:

General positive mood/affect	1	2	3	4	5
Motor skills	1	2	3	4	5
Sensitivity to sensory stimuli	1	2	3	4	5
Social skills	1	2	3	4	5
Stereotypic behaviors	1	2	3	4	5
Swimming skills	1	2	3	4	5
Comfort in the water	1	2	3	4	5
Please list any OTHER frequently observed effects below					
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

23) Please indicate the type of effect **PARENTS REPORT** aquatic intervention to have on each of the following:

	Frequently decreases	Occasionally decreases	No change	Occasionally increases	Frequently increases
General positive mood/affect	1	2	3	4	5
Motor skills	1	2	3	4	5
Sensitivity to sensory stimuli	1	2	3	4	5

Social skills	1	2	3	4	5
Stereotypic behaviors	1	2	3	4	5
Swimming skills	1	2	3	4	5
Comfort in the water	1	2	3	4	5
Please list any OTHER effects PARENTS frequently report below					
	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

Please use the space below to write any additional comments that you feel would be valuable to the researcher of this study.

Thank you for your participation, the information you have provided is very important to this study! Please use the enclosed paid-postage envelope to return this questionnaire and have a great day!

Initial mailing cover sheet

Dear Occupational Therapist or Supervisor:

We are conducting a survey to investigate the practice patterns of occupational therapists who are using aquatic therapy as an intervention in the treatment of children ages 3-18 diagnosed with an Autism Spectrum Disorder (ASD). You have been sent this questionnaire because your facility was identified in an internet search as employing occupational therapists, treating clients with an ASD, and using aquatic therapy. This study aims to investigate the professional characteristics and practice patterns of occupational therapists who are using this intervention technique, as well as the outcomes that they are observing. *If you are a supervisor, we respectfully request that you deliver this questionnaire to the occupational therapist at your facility that you feel is most appropriate to participate in this study.*

The questionnaire should take approximately 20 minutes to complete. You have the right to skip any question or discontinue answering questions at any time. A stamped

and addressed envelope is included for your convenience in returning the questionnaire. Please return your completed questionnaire within 1 week of receiving it.

Our receipt of your questionnaire implies that you have read and understand the above information, and consent to the use of your responses in an analysis. Your identity and individual responses will be kept confidential. Once your completed questionnaire is received, the coded mailing envelope will be immediately destroyed, no identifying information will be on the questionnaire. Once questionnaires are no longer needed for data checking they will be destroyed. Please contact the primary investigator at the address below if you have any questions about this study. Thank you in advance for your participation.

Sincerely,

Maggie Dubois, OTS
Primary Investigator
University of Puget Sound
School of Occupational Therapy
1500 N. Warner St.
Tacoma, WA 98417
mdubois@pugetsound.edu

Renee Watling, PhD, OTR/L, FAOTA
Co-Investigator
University of Puget Sound
School of Occupational Therapy
1500 N. Warner St.
Tacoma, WA 98417
rwatling@pugetsound.edu

Second mailing Cover sheet

Dear Occupational Therapist or Supervisor:

Approximately two weeks ago we sent you a questionnaire packet seeking your participation in a study investigating the practice patterns of occupational therapists who are using aquatic therapy as an intervention in the treatment of children ages 3-18 diagnosed with an Autism Spectrum Disorder (ASD). As of today, we have not received your completed questionnaire. We realize that you may not have had time to complete it. However, we would genuinely appreciate your response. *If you are a supervisor, we respectfully request that you deliver this questionnaire to the occupational therapist at your facility that you feel is most appropriate to participate in this study.*

The questionnaire should take approximately 20 minutes to complete. You have the right to skip any question or discontinue the questionnaire at any time. A stamped and addressed envelope is included for your convenience in returning the questionnaire.

Our receipt of this questionnaire implies that you have read and understand the above information, and consent to the use of your responses in an analysis. Your identity and individual responses will be kept confidential. Once your completed questionnaire is received, the mailing envelope will be immediately destroyed. Once questionnaires are no longer needed they will be destroyed.

In the event that your questionnaire has been misplaced, a replacement packet is enclosed. Please return your completed questionnaire within 1 week of receiving it. Please contact the primary investigator at the address below if you have any questions about this study. Thank you in advance for your participation.

Sincerely,

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