Clinicians' Perceptions of the Benefits of Aquatic Therapy for Young Children with Autism: A Preliminary Study

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ABSTRACT. Objective: This purpose of this study was to identify clinicians' perceptions of the benefits of aquatic therapy for young children with autism. Methods: Eighteen aquatic occupational therapists treating young children with autism responded to a survey soliciting their opinions on changes in skill performance resulting from aquatic therapy. Results: A majority of clinicians reported a substantial increase in swim skills, attention, muscle strength, balance, tolerating touch, initiating/

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maintaining eye contact, and water safety. 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 this preliminary study, clinicians identified the areas they perceived as improving as a result of aquatic therapy. This information could help narrow the field of likely outcomes as a first step toward studies of the effectiveness of aquatic therapy for children with autism.

KEYWORDS. Aquatic therapy, autism, hydrotherapy, pervasive child development disorders

Water has been used for rehabilitative purposes for over 100 years (Irion, 1997). For much of that time, therapy in the aquatic environment has been applied to the treatment of individuals with musculosketal or neuromuscular conditions. Pediatric populations have included children with muscular dystrophy (Adams & Chandler, 1974), cerebral palsy (Harris, 1978; Hutzler, Chacham, Bergman, & Szeinberg, 1998; Peganoff, 1984), cystic fibrosis (Zach, Purrer, & Oberwaldner, 1981), spina bifida (Styer-Acevedo, 1997), and Rett Syndrome (Lotan & Hadar-Frumer, 2004). The primary emphasis of aquatic therapy for children has been on improving physical function (Dulcy, 1983; Martin, 1983), although psychological benefits, such as a sense of accomplishment, greater confidence, and improved self-esteem, have also been reported (Martin, 1983; Peganoff, 1984). Recently, clinicians have expanded the use of aquatic therapy to a new population–children with autism.

Autism (i.e., autistic disorder) is a life-long condition that impacts the functioning of the individual and his or her family in all areas of life. It is found in all ethnic, racial, intellectual, and socioeconomic groups (Rogers, Gordon, Schanzenbacher, & Case-Smith, 2001). The prevalence of autism appears to have increased in recent years. A recent report using 1996 data found 34 cases of autism spectrum disorders (i.e., autistic disorder, Asperger disorder, pervasive developmental disorder not otherwise specified) per 10,000 children in a five-county metropolitan area (i.e., Atlanta, Georgia) (Yeargin-Allsopp et al., 2003). This prevalence rate is higher than those reported in studies of autism conducted during

the 1980s and early 1990s. It is not known whether the increase in prevalence is due to an actual rise in the number of cases of autism, improved recognition, or changes in diagnostic criteria (Yeargin-Allsopp et al., 2003).

Symptoms of autism appear by age three (American Psychiatric Association, 2000). To be diagnosed with autistic disorder, an individual must show at least two impairments in social interaction, one impairment in the area of communication, and one restricted repetitive and stereotyped pattern of behavior, interest, or activity (American Psychiatric Association, 2000). Typical impairments in the area of social interaction include lack of eye contact, facial expression, or common social gestures (e.g., pointing); failure to develop appropriate peer relationships with reduced awareness of others and a tendency to play alone; and decreased spontaneous sharing of enjoyment, interests, or achievement. Typical communication deficits include delayed or absent spoken language without attempts to communicate in an alternative way (e.g., signs or gestures). Those children who use spoken language may have difficulty initiating and sustaining conversation. Their speech may have abnormal pitch, intonation, rate, or rhythm. There may be stereotyped and repetitive use of language. Children with autism may also display repetitive and stereotyped patterns of behavior, activities, and interests. They may show an intolerance of change in routine. Repetitive body movements such as hand flapping, rocking, or swaying are common.

Sensory integration (SI) techniques are commonly used in treating children with autism (Case-Smith & Miller, 1999). SI therapy aims to increase or decrease arousal level in order to achieve a more optimal, moderate level. It is thought that a more moderate arousal level improves the child's ability to interpret and use sensory input. This, in turn, may result in improved ability to interact and learn from the environment and participate in other activities. While research in this area has been limited, several authors have reported benefits from using SI techniques with children with autism (Ayres, 1979; Field et al., 1997; Linderman & Stewart, 1998; Zisserman, 1992).

Pediatric aquatic therapists have recognized the potential for treating children with autism in the water environment as an adjunct to traditional SI techniques. The consistent temperature, buoyancy, relative density, viscosity, and resistance of the water provide relatively constant somatosensory input. In addition, the water provides an even pressure to the entire body (Becker, 1997). These properties of water may be useful in moderating the arousal level of the child with autism. As a result, the child may be able to more fully engage in and learn from the

aquatic therapy exercises and activities with the hope of generalizing those improvements to land-based performance and social participation.

There are anecdotal reports from clinicians of the positive effects of using aquatic therapy with children with autism. There are also anecdotal reports of the benefits of swimming from parents of children with autism (e.g., see Harlan, 2002). However, there are no research studies of the effectiveness of this intervention. One of the first steps in establishing a new line of research is to identify the key dependent variables. This poses a problem in a condition such as autism where the wide-ranging nature of the associated impairments results in a large number of potential outcomes. The difficulty lies in accurately predicting which skills and/or behaviors of children with autism would be most likely to change as a result of an aquatic therapy intervention and, therefore, should be the focus of inquiry. Changes could run the gamut from improvements in multiple body functions to improved participation in various life situations (World Health Organization, 2001). The difficulty relating to the large number and the variability of possible outcomes is compounded by some outcomes of interest that are difficult to operationally define and measure (e.g., increased eye contact). Spending time and money determining how to measure such outcomes, if they do not turn out to be important, is an inefficient use of limited resources.

In order to maximize research efforts in this area, it would be helpful to identify the outcome variables most likely to change as a result of aquatic therapy prior to conducting intervention studies. This study provides a foundation for further research in the effectiveness of aquatic therapy for children with autism by identifying the positive outcomes that practicing clinicians perceive to be most common.

METHODS

The target population for this study was occupational therapists who had used aquatic therapy for a minimum of one month to treat young children with autism. The required age range for the children receiving services was four to ten years. We identified seventy-eight potential participants from around the United States through aquatic therapy networks and personal and business web sites.

We developed a mailing survey based on a literature review and interviews with a local occupational therapist using aquatic therapy to treat children with autism and two parents of children with autism receiving aquatic therapy. The interviews focused on identifying the per-

ceived benefits of aquatic therapy for this population from clinician and parent perspectives. The survey consisted of three sections. The first section determined eligibility for the survey as described above (i.e., provision of aquatic therapy services for children with autism within the required age range and for the required time period). The second section of the survey consisted of four open-ended questions relating to the ages of the children with autism who received services and the length, duration, and frequency of the aquatic therapy sessions. The third section of the survey consisted of 24 questions relating to the therapists' perceived outcomes of aquatic therapy for children with autism. Respondents answered the first 21 questions in this section using a 5-point scale to rate change in skill performance from "substantial decrease" to "substantial increase." "Don't know" and "not relevant" responses were also available. Nineteen questions asked respondents to rate specific items. Two questions gave respondents an opportunity to list and rate any other outcomes they had observed. The three final questions in this section required participants to give a categorical response regarding specific outcomes that did not fit into the 5-point scale format. These included questions on self-stimulating behaviors, enjoyment of aquatic therapy, and family participation in water activities. We followed the initial mailing of the survey with a series of reminder mailings designed to maximize participation as per the survey procedures described by Dillman (2000).

RESULTS

Of the 78 surveys sent out, forty-eight were returned. Nine surveys were not returned and twenty-one were non-deliverable. Thirty (63%) of the 48 aquatic therapists who returned surveys did not treat children with autism between the ages of four to ten years. The results reported here are based on the responses of the eighteen responding clinicians who provided aquatic therapy services for young children with autism. These clinicians practiced in all four geographic regions of the United States. Fifty percent (9 respondents) practiced in the Midwest, 33% (6) practiced in the West, 11% (2) practiced in the Northeast, and 6% (1) practiced in the South.

The median length of a typical aquatic therapy session was 45 minutes (range 30 minutes to 1 hour). The median number of aquatic therapy sessions was four per month (range one to eight sessions). The duration of therapy varied greatly among therapists, and many thera-

pists indicated that it varied among children. The shortest duration of completed treatment reported was three months and the longest duration was two years. In two instances, treatment was on-going at the time of the survey. It was not possible to calculate an average duration length as many therapists reported a range rather than a single number.

Table 1 presents the results of the 19 survey questions where therapists rated changes in skill performance for specified outcomes. Please note that while category headings are provided in the Table for ease of reference, skill items were not categorized on the survey. The majority

TABLE 1. Percent of Occupational Therapists Reporting Change in Performance in Specific Skill Areas

Skill Area	Substantial Decrease	Slight Decrease	No Change	Slight Increase	Substantial Increase	Don't Know	Not Relevant
Motor							
Gross motor skills	0	0	11	39	33	17	0
Fine motor skills	0	0	17	56	11	11	6
Muscle strength	0	0	6	28	61	6	0
Balance	0	0	6	28	61	6	0
Sensory							
Tolerating touch	0	0	0	39	61	0	0
Tolerating crowded or loud areas	0	0	5	39	44	11	0
Social							
Initiating and maintaining eye contact	0	0	0	44	56	0	0
Initiating conversation with others	0	0	0	61	28	11	0
Initiating play with others	0	0	18	47	35	0	0
Taking turns	0	0	6	61	33	0	0
Getting along with other children	0	0	6	67	22	6	0
Asking for help	0	6	17	44	33	0	0
Behavioral							
Behaving as expected (age or situational appropriateness)	0	0	22	50	28	0	0
Concentrating or paying attention	0	0	0	33	67	0	0
Following directions	0	0	11	39	50	0	0
Appearing confident	0	0	12	47	35	6	0
Academics							
Performing academic skills	0	0	0	31	0	63	6
Swimming							
Performing swim skills	0	0	11	11	72	5	0
Demonstrating water safety	0	0	5	39	56	0	0

of therapists indicated a substantial increase in skill performance in seven of these outcomes: performing swim skills (72%), concentrating or paying attention (67%), muscle strength (61%), maintaining balance (61%), tolerating touch (61%), initiating and maintaining eye contact (56%), and demonstrating water safety (56%). One hundred percent of the therapists surveyed indicated either a slight or substantial increase in skill performance for tolerating touch, initiating and maintaining eye contact, and concentrating or paying attention. There were no skill items that therapists felt substantially decreased as a result of aquatic therapy and only one, asking for help, that some therapists (6%) identified as decreasing slightly. The majority of therapists indicated a "don't know" response for performing academic skills.

In response to the outcome questions that required a categorical response, 83% of therapists felt the children performed less self-stimulating behaviors as a result of aquatic therapy. Eighty-nine percent reported that the families participated in more water activities since the beginning of the aquatic therapy sessions. One hundred percent of therapists indicated that the children enjoyed aquatic therapy.

In response to the open-ended section of the survey, individual therapists (i.e., one respondent per comment) identified the following as showing a substantial increase in performance as a result of aquatic therapy: toleration of supine position, reciprocal upper extremity movement, bilateral motor coordination, gravitational security, motor modulation, lip closure, blowing air out of lips, body awareness, sensory modulation, seeking appropriate input, motivation, making transitions, impulse control, risk taking, expanding out of comfort area, participating in extracurricular activities, self-initiated play, and nutritional intake. In addition, three therapists reported a substantial increase in skill performance in activities of daily living.

DISCUSSION

We found a relatively small percentage (i.e., just over one-third of the 48 respondents) of aquatic occupational therapists treating young children with autism. These clinicians reported somewhat similar aquatic therapy practices. The most frequently reported benefits from the perspective of the clinicians ranged from improved performance in underlying skills (e.g., improved strength, balance) at the body function level (World Health Organization, 2001) to increased social participation (World Health Organization, 2001) in water activities as a family. There

were seven areas (swim skills, paying attention, muscle strength, balance, tolerating touch, eye contact, and water safety) where at least half of clinicians reported a substantial increase in skill performance and two areas (self-stimulating behaviors, participation in water activities) where over 80% of clinicians reported positive change. All therapists stated that the children they treated enjoyed aquatic therapy.

The one skill area where some therapists (6%) reported a slight decrease was asking for help. At the same time, 77% of therapists reported a slight or substantial increase in this area. While we attempted to frame all of the survey questions so that an increase in performance would reflect a positive change, in retrospect we believe that either a decrease or an increase in asking for help could be interpreted as improvement. For example, if a child is asking for help less often, it may mean that he or she is more independent. On the other hand, it may reflect less willingness to initiate contact with others. Similar interpretations in the opposite direction could be made for the situation where a child is asking for help more often. Given this ambiguity, we feel that we cannot draw any unequivocal conclusions about the results for this question.

The findings from this preliminary study provide some guidance to investigators interested in researching the effectiveness of aquatic therapy for children with autism by giving information about what dependent variables an investigator might choose to study. Future investigators could proceed by choosing one or more of the outcomes identified in this study that were thought to improve the greatest amount by the greatest number of therapists. Alternatively, investigators could develop a composite measure that combines key outcomes into one score for comparison of intervention and control groups (O'Brien, 1984). In using a composite outcome measure, all participants are initially ranked separately on each measure included. The rank scores are then summed to give the final score used for comparison of outcomes between groups. This data analysis strategy has been used in intervention studies of other diverse populations with wide-ranging outcomes such as traumatic brain injury (Bell et al., 2005).

This study also gives some guidance as to which variables an investigator might not choose to study. For example, improved eye contact in children with autism would be an outcome of interest to many. However, eye contact is a construct that is difficult to measure in a reliable and valid fashion. Knowing that only 56% of respondents in this study perceived eye contact as substantially improving with aquatic therapy, investigators might not choose to invest the resources required to develop an appropriate measure.

This study has several limitations. The sample size was small. While this may be a reflection of the recent expansion of aquatic therapy to this population and/or restriction of the study to children within a limited age range, the possibility for bias with this type of study remains. It is possible that the clinicians who responded to the survey were those who were most positive about the benefits of aquatic therapy. Less enthusiastic clinicians might report different benefits or lesser degrees of improvement. In addition, the sample was restricted to aquatic therapists who were also occupational therapists. It is possible that aquatic physical therapists might perceive the benefits differently. The parents of the children receiving services might also have a different perspective. Replication of the study with physical therapists and parents of children with autism would provide a more comprehensive view of the perceived benefits.

Research studies are needed to investigate the effectiveness of aquatic therapy for the treatment of autism. Efficacy studies are especially important in the current climate of diminished resources for services; increased accountability; and increased value by practitioners, consumers, and third-party payers on research-based clinical practice. This study could help maximize such efforts in investigations of aquatic therapy for children with autism by narrowing the field of possible beneficial outcomes. This is especially critical in this situation where there are a large number of possible outcomes and where many of those possible outcomes are difficult to operationally define and measure. This preliminary study provides a foundation for further research on the effectiveness of aquatic therapy for children with autism by helping identify the outcomes of interest for those research efforts.

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