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## Aquatic Developmental Play Program for Children in Early Intervention: A Case Series

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# Aquatic Developmental Play Program for Children in Early Intervention: A Case Series

## Abstract

*Background:* Despite limited evidence, aquatic programming has the potential to be an ideal intervention for young children with disabilities because of its unique and dynamic properties. This study explored the impact of an aquatic developmental play program in addressing sensory integration and motor development needs of children with disabilities as well as its impact on parental isolation.

*Methods:* A case series design was used. Children with disabilities under 3 years of age and their parents participated in a 9-week aquatic developmental play program held in the community. Goals were individualized for each participant and monitored using the Goal Attainment Scaling (GAS) method. The Sensory Profile 2, the Developmental Assessment of Young Children-Second Edition (DAYC-2), and a Parent Support Survey were administered before and after the study.

*Results:* Seventy-nine percent of the individual goals were met or exceeded expectations among the 11 participants with categorical changes observed on the Sensory Profile 2 and the DAYC-2. Parental satisfaction with services increased and parental feelings of isolation decreased following the aquatic play program.

*Conclusion:* The results suggest that aquatic programming held in the community may be beneficial not only for the individual needs of children with disabilities but also for the needs of parents.

## Keywords

autism, occupational therapy, pediatrics, therapy

## Cover Page Footnote

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## Credentials Display

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Families receive early intervention (EI) services following the guidelines set by Part C of the Individuals with Disabilities Education Act (IDEA), a government-funded program that allows children to receive services in the “natural” environment using a family-centered model (IDEA, 2004). According to IDEA Part C, natural environments are defined as “settings that are natural or typical for a same-aged infant or toddler without a disability [and] may include the home or community settings” (U.S. Department of Education, n.d., para. 1). Beyond focusing on the family, EI occupational therapists also prioritize supporting transitioning outside of EI services after 3 years of age to foster social inclusion in the community (American Occupational Therapy Association [AOTA], 2017).

Children receiving EI services often have deficits in overall motor development and sensory processing, which act as barriers to participation in family life in the community (Blanche et al., 2016; Dunn, 2007; Scarborough et al., 2004). Occupational therapists are well-equipped to focus on motor development and sensory processing in the EI setting (Muhlenhaupt, 2005). Furthermore, because “a family is a child’s foundation and provides the context for optimal development to occur,” prioritizing parental preferences for the programming they and their children will receive is necessary to ensure satisfaction with services (Stoffel et al., 2017, p. 9). Without programming that is appropriate to the family’s needs, parents and caregivers can feel a sense of social isolation as a result of their child’s disability (Lakshmanan et al., 2017). Therefore, an ideal EI program must be engaging, family-centered, and effective at addressing child outcomes while also providing parental education and opportunities for social engagement in the community.

Aquatic programming, defined by the American Physical Therapy Association (2018) as the “evidence-based and skilled practice” of therapy in an aquatic environment (para. 1), has the potential to meet the criteria for an ideal EI program. It targets both sensory processing needs and areas of motor development in children with a variety of conditions (Lawson & Little, 2017; Mortimer et al., 2014; Oriol et al., 2017). The aquatic environment is conducive to therapeutic motor interventions because of its inherent hydrodynamic qualities: buoyancy, relative density, viscosity, resistance, hydrostatic pressure, turbulence, and flow. It also provides a dynamic sensory environment with exposure to various stimuli, such as water temperature, anti-gravity sensation, tactile sensation, consistent proprioceptive input, and vestibular input aligned with sensory processing (Dunn, 2007; Mortimer et al., 2014).

The impact of aquatic therapy has also been studied among premature infants in the neonatal intensive care unit and with typical infants attending baby swimming groups (Costa et al., 2016; de Oliveira Tobinaga et al., 2016). However, no studies have examined the effectiveness of an aquatic developmental playgroup for children receiving EI services in promoting sensory processing and motor development, nor has the impact on parental isolation been addressed. To increase community integration and social participation for both the parents and children included in the EI population, an aquatic developmental play intervention held in the community was designed to promote overall activity participation and engagement while maintaining the family-centered model in the natural environment (IDEA, 2004).

This study aimed to examine the effectiveness of an aquatic developmental play program for children with disabilities under 3 years of age using a case series. The research questions were: (a) Is a family-centered aquatic developmental play program effective in addressing motor development and sensory processing deficits in infants and young children enrolled in EI services? and (b) Does an aquatic developmental play program held in the community that focuses on the developmental skills of the child

and the social participation needs of parents enrolled in EI services lessen parental feelings of social isolation?

### Method

When conducting research in the area of EI and early childhood special education, case series design is recommended because it uses each participant as his or her own control to identify trends and variability as a result of the intervention applied; furthermore, it has been “explicitly identified as a credible research design” by the U. S. Department of Education’s Institution for Education Services, a primary funding agency for EI and early childhood special education research (Barton et al., 2016, p. 5). A case series research design using an A-B-A format was used to analyze the developmental outcomes of an aquatic play program in the areas of sensory processing and motor skill development.

Using the A-B-A design, data were collected every 15 min during the 30-min individual sessions for each child. The phases of the intervention adhered to the following guidelines:

- A: The child was observed performing pre identified behaviors without any intervention (baseline; three data probes).
- B: The child was observed weekly performing behaviors with parental involvement with intervention provided in the way of education, verbal instruction, demonstration, physical assistance, and/or repetitive practice in an engaging manner (intervention; 12 data probes).
- A: The child was observed performing behaviors without intervention immediately following completion of the intervention phase (return to baseline; three data probes).

The phases of the research design were strictly adhered to in order to determine the effectiveness of the program and to monitor each child’s progress through the repetition of activities for each goal. Blinding did not occur, as recruitment, initial evaluations, goal-setting, and interventions were carried out by the occupational therapy doctorate (OTD) student under the supervision of the faculty advisor. Touro University Nevada’s Institutional Review Board approved this study and informed consent was obtained from the parents of each participant.

Each parent-child dyad completed an initial evaluation that collected information regarding birth history, individual strengths, weaknesses, and parent concerns and priorities. Three or more individual goals for each child were developed based on a parent interview, clinical observations, and the administration of standardized assessments. The activities used to address individualized areas during the sessions are listed in Table 1.

After individual goals were established for each child with the collaboration of the family, the parent-child dyads were placed into groups of 3 to 4 participants based on similar goals and abilities. Data were not collected during group sessions; instead, group sessions allowed for the parents to apply handling techniques and intervention strategies taught during individual sessions. There was also a time for bonding between parent and child and social interactions between the other parent-child teams. Each of the 11 parent-child dyads completed all nine individual and group sessions.

The aquatic developmental play program was conducted at a typical swim school in the community that offers swim instruction to children of all ages. The program was conducted by an OTD student with over 35 years of training in aquatics and certified in lifeguard training as well as infant/toddler swim instruction. An occupational therapist with over 25 years of experience supervised the OTD student. However, an aquatic developmental play program can be run at a community pool with a lifeguard on hand without the occupational therapist needing to be lifeguard certified. Each participant completed nine

## AQUATIC PLAY PROGRAM

individual and nine group sessions over a period of 9 weeks. Each session lasted 30 min. Sessions were held in a shallow (3½-4½ feet) indoor pool heated to 92°, an ideal temperature for therapeutic activities.

**Table 1**

*Activities Performed During Sessions to Address Individualized Areas*

<b>DOMAIN</b>	
<b>GROSS MOTOR</b>	
<b>Lower Extremity Strengthening/Coordination/Motor Planning</b> <ul style="list-style-type: none"> <li>- Climbing up/down pool stairs</li> <li>- Safe water exit</li> <li>- Kicking laps</li> </ul>	<b>Functional Mobility</b> <ul style="list-style-type: none"> <li>- Kicking laps</li> <li>- Safe water exit</li> <li>- Creeping with physical handling</li> </ul>
<b>Upper Body/Lower Body Separation of Movement</b> <ul style="list-style-type: none"> <li>- Kicking laps</li> <li>- Safe water exit</li> </ul>	<b>Dynamic Standing Balance</b> <ul style="list-style-type: none"> <li>- Throwing toys at target</li> <li>- Engaged in reciprocal play with parent</li> </ul>
<b>Postural Control</b> <ul style="list-style-type: none"> <li>- Engaged in play while seated on kickboard</li> <li>- Engaged in play while lying on stomach on kickboard</li> <li>- Neck rotation while lying on stomach on kickboards</li> </ul>	
<b>FINE MOTOR</b>	
<b>Reach/Grasp</b> <ul style="list-style-type: none"> <li>- Engaged in play while seated on kickboard</li> <li>- Retrieve toys from water/floating surface mat</li> </ul>	<b>Tool/Utensil Use</b> <ul style="list-style-type: none"> <li>- Scooping toys with small net</li> <li>- Using tongs to pick up toys and empty into bucket</li> </ul>
<b>Intentional Release</b> <ul style="list-style-type: none"> <li>- Release toys into bucket during play activities</li> </ul>	<b>Bilateral Integration</b> <ul style="list-style-type: none"> <li>- Reach/grasp toy in each hand and bring to the midline during play activities</li> </ul>
<b>Pincer Grasp/Fine Motor Coordination</b> <ul style="list-style-type: none"> <li>- Using tongs to pick up toys and empty into bucket</li> <li>- Remove toys from small buckets using only fingertips</li> <li>- Stack toy buckets</li> </ul>	
<b>SENSORY PROCESSING</b>	
<b>Self-Regulation</b> <ul style="list-style-type: none"> <li>- Monitor behavioral and emotional regulation through heavy work and movement in the water</li> </ul>	<b>Attention to Task</b> <ul style="list-style-type: none"> <li>- Maintain focus during functional play activities</li> </ul>
<b>Arousal State/Self-Modulation</b> <ul style="list-style-type: none"> <li>- Heavy work and movement in water through participation in obstacle course</li> </ul>	<b>Direction Following</b> <ul style="list-style-type: none"> <li>- 1-, 2-, 3-step commands</li> <li>- Hand toys to Mom; place toys in bucket</li> <li>- Choose specific toy and complete specific action</li> <li>- Scoop toy, bring to bucket, empty in bucket</li> </ul>
<b>SOCIAL SKILLS</b>	
<b>Sharing/Taking Turns</b> <ul style="list-style-type: none"> <li>- Take turns with OTD student, parent, or peers during song/games/activities</li> </ul>	<b>Direction Following</b> <ul style="list-style-type: none"> <li>- Follow commands during group play</li> </ul>
<b>Social Communication</b> <ul style="list-style-type: none"> <li>- Verbalize or sign “please” during activities or to enter water</li> <li>- Point at toys to identify choice</li> </ul>	<b>Peer Modeling</b> <ul style="list-style-type: none"> <li>- Participate in aquatic activities alongside peers in group session or typical peers in community pool environment</li> </ul>
<b>WATER SAFETY</b>	
<b>Proper Stair Use</b> <ul style="list-style-type: none"> <li>- Practice walking up/down pool stairs in safe, slow, controlled manner using handrail</li> </ul>	<b>“Please” to Enter Water</b> <ul style="list-style-type: none"> <li>- Impulse control to not enter water until make a request verbally or using sign language</li> </ul>
<b>Safe Water Entry</b> <ul style="list-style-type: none"> <li>- Sit on edge of pool or floating water mat and, when prompted, turn to belly, slide in water, and hold onto edge of pool</li> </ul>	<b>Wall Walks</b> <ul style="list-style-type: none"> <li>- Use upper body strength/coordination to hold head above water while moving along edge of pool by hanging on edge</li> </ul>

## **Participants**

Participants were recruited through word-of-mouth and via flyers distributed to four EI agencies and two outpatient occupational therapy clinics in a city in the southwestern United States. Participants were eligible for the study if they were under 3 years of age with a known disability or developmental delay and had an English-speaking caregiver available to accompany them in the water during every session. Children were excluded if they were older than 3 years of age, seizure disorders were present, they required a tracheostomy for respiratory support, or they were determined by the researchers to have behavioral or communication deficits that prevented them from staying within arm's reach of the parent or researcher. Through purposive sampling, 11 parent-child dyads participated in the study. The age range of the children was 8.5 months to 35 months. The children were diagnosed with cerebral palsy (CP; n = 1), autism spectrum disorder (ASD; n = 3), Down syndrome (DS; n = 3), and other conditions that result in developmental delays (DD; n = 4). The children concurrently participated in various early intervention services: developmental specialist, occupational therapy, physical therapy, and/or speech therapy, which ranged from one to eight sessions per month.

## **Measures**

Several standardized and non-standardized assessments were administered before and after the program to quantify the effectiveness of the aquatic play program for promoting sensory and/or motor development characteristics of children under 3 years of age with disabilities.

### ***Sensory Profile 2***

Developed from the Model of Sensory Processing (Dunn, 1997), the Sensory Profile 2 (Dunn, 2014) is a standardized assessment used by occupational therapists to determine the sensory preferences of infants and young children as reported by the parents. These sensory processing preferences can show a child's sensory strengths and challenges during participation in everyday life (Dunn, 2007). The assessment can then be used to plan interventions and remediation strategies. Validity was shown for this parent report survey when significant differences were found between typically developing peers and known vulnerable groups. The Toddler Sensory Profile 2 scored .57–.80 for internal consistency and .83–.92 for test-retest reliability when measuring sensory processing characteristics (Pearson Education, 2019).

### ***Developmental Assessment of Young Children-Second Edition***

The standardized Developmental Assessment of Young Children-Second Edition ([DAYC-2] (Voress & Maddox, 2012) was used to assess the gross and fine domains of motor development, as well as overall physical development, before and after the intervention. The DAYC-2 was normed on a national sample of 1,832 children in 2009–2011 and has demonstrated established reliability and validity.

### ***Parental Support Survey***

Another focus of the study was the parents' feelings of isolation, their satisfaction with the current therapy services they are receiving, and their perceived value of the program. The Parent Support Survey (see Appendix A) was created for this study to measure isolation and satisfaction by adapting questions from a Satisfaction Survey and Control Survey in Broggi and Sabatelli (2010) and evaluated by the second author with over 25 years of pediatric experience. The parents of all the participants were asked to complete the survey before and after the program. The post intervention version of the Parent Support Survey also contained additional questions regarding the social validity of the program.

### ***Goal Attainment Scaling***

Goal attainment scaling (GAS) was used to evaluate the progress of individual participants as well as monitor overall program effectiveness for young children (McDougall & King, 2007). GAS has been used to measure sensory differences in children with developmental disabilities to determine the effectiveness of sensory interventions (Pfeiffer et al., 2011). The goals were developed in collaboration with the parents. Reliability and validity of GAS were addressed using two separate approaches: (a) interrater reliability between the two researchers in the study was estimated by independently scoring the goals in over 25% of the sessions, and the result was 91% agreement; (b) two standardized assessments, the Sensory Profile 2 and the DAYC-2, were used to supplement GAS, adding the dimensions of sensory processing and motor skills.

### **Analysis**

Four types of measures were used to provide a comprehensive and holistic view of the outcome of the aquatic play program: the measure of individualized goals, norm reference tools, and parental input. GAS data were visually analyzed by individual and goal type and aggregated into a T score as described in Turner-Stokes (2009) before and after the aquatic play program to observe the progress of individual participants (McDougall & King, 2007). Pre and post scores from the Sensory Profile 2 and the DAYC-2 were compared to determine other developmental changes following intervention implementation. Pre and post results of the Parent Support Survey were compared to determine changes in parental feelings of isolation and satisfaction with services.

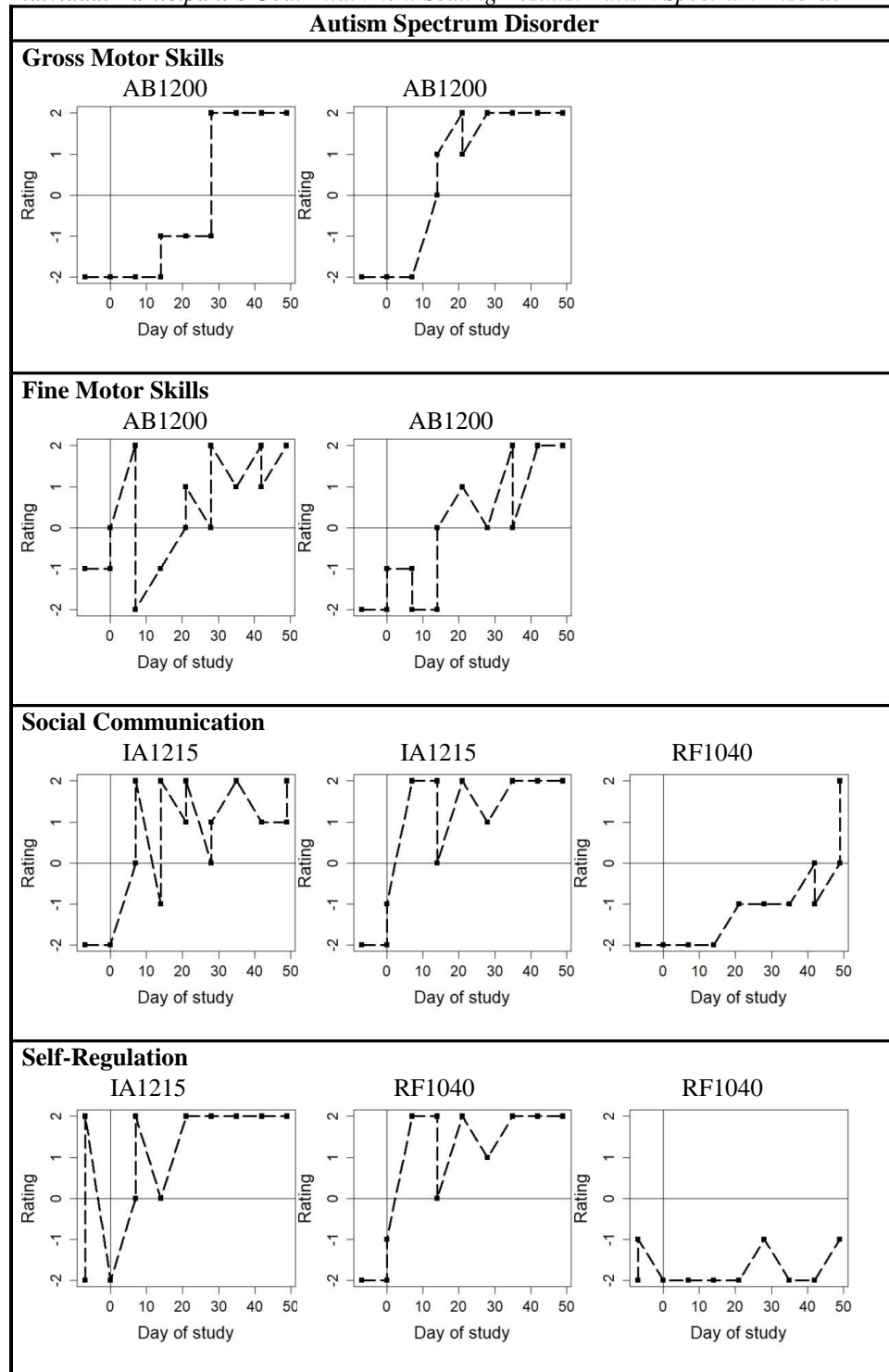
### **Results**

The progress on individualized goals made by each of the 11 participants (each participant represented by a different number) is exhibited in Figures 1–4. For the three participants diagnosed with ASD (see Figure 1), 100% of the participants exceeded their social communication, fine motor skills, and gross motor skills. These participants also exceeded expectations for two of three self-regulation goals.

The four participants with DD (see Figure 2) exceeded expectations for two of four gross motor goals, met expectations for one of the four gross motor goals, and did not meet expectations for one of the gross motor goals. In fine motor development, the participants with DD met their fine motor goals and exceeded expectations for self-regulation goals; however, only half of the social communication goals were met.

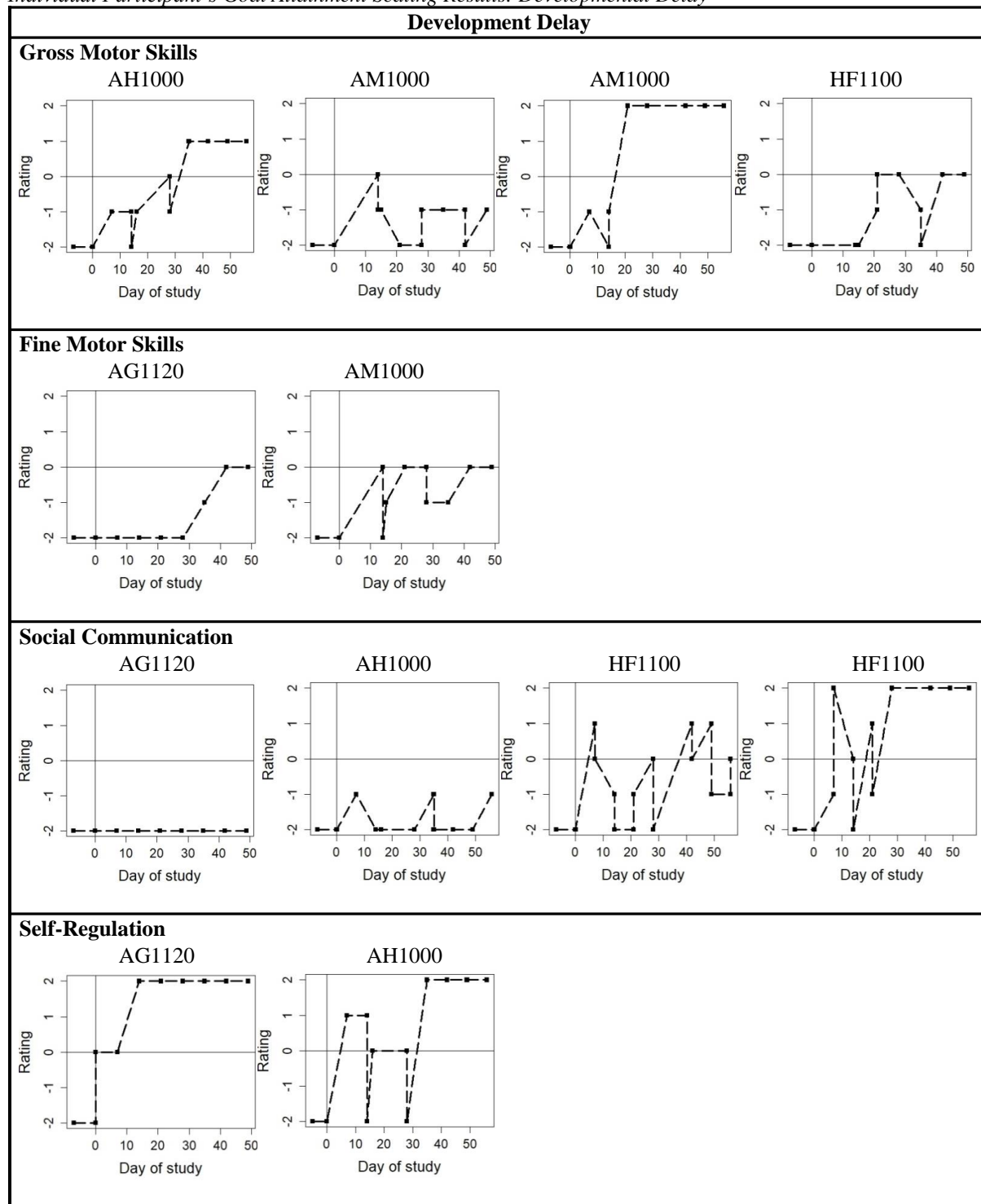
The three participants with DS (see Figure 3) met or exceeded expectations for all their gross motor, fine motor, and social communication goals. The one participant with CP (see Figure 4) did not meet any of his goals consistently.

**Figure 1**  
*Individual Participant's Goal Attainment Scaling Results: Autism Spectrum Disorder*

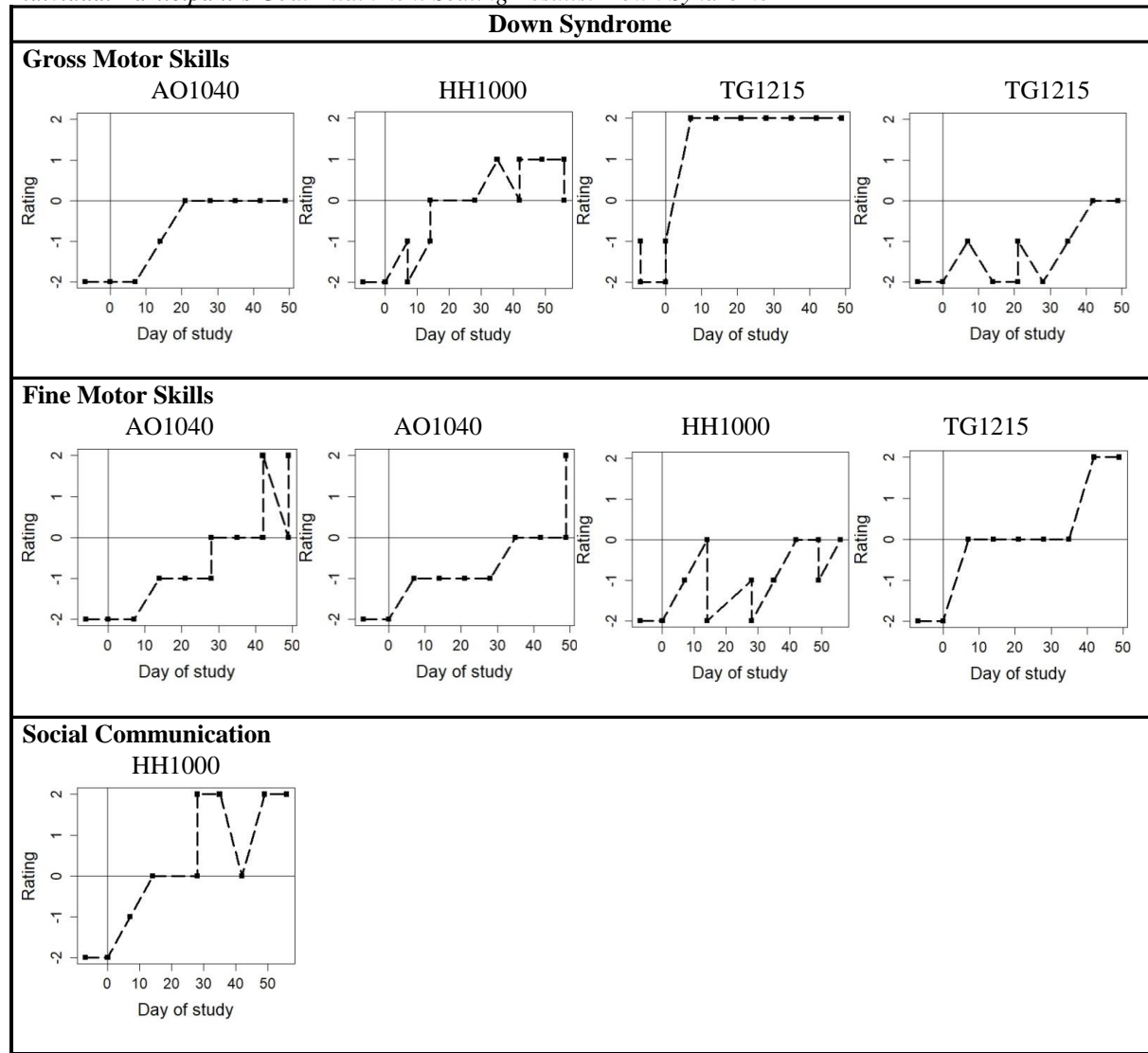




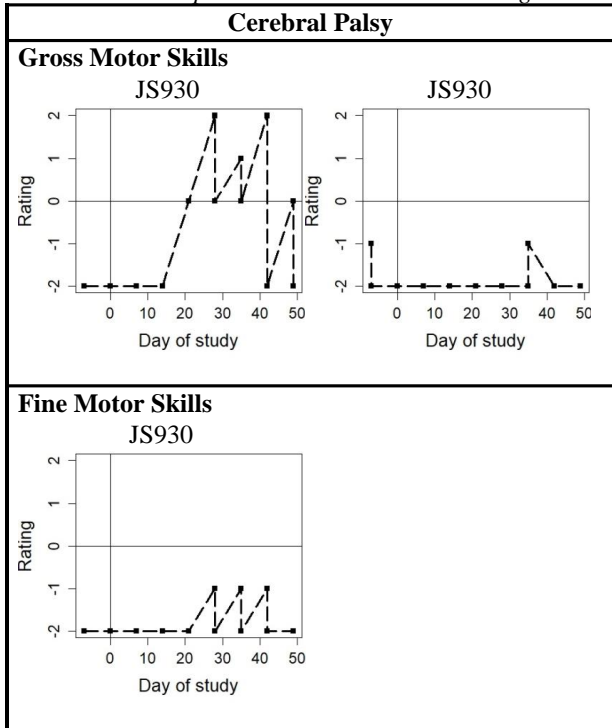
**Figure 2**  
*Individual Participant's Goal Attainment Scaling Results: Developmental Delay*



**Figure 3**  
*Individual Participant's Goal Attainment Scaling Results: Down Syndrome*



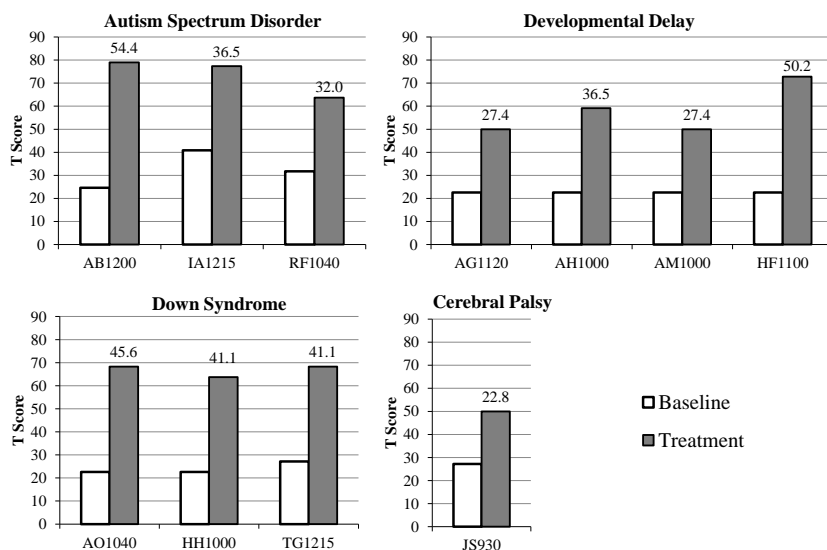
**Figure 4**  
*Individual Participant's Goal Attainment Scaling Results: Cerebral Palsy*



Note. The horizontal line at level 0 for each goal indicates the expected level of performance at the end of the program.

Differences in aggregate T-scores summarized the progress that each individual made across all their goals (see Figure 5). All of the participants in the aquatic play program had improved T scores, with the children with ASD and DS achieving the most difference, followed by children with DD, who had wide variation in improvement levels. The participant with CP showed the least amount of progress toward the defined goals.

**Figure 5**  
*Individual Baseline and Treatment Aggregate T scores by Diagnosis*



Note. Differences (before-after) in aggregate T scores by diagnosis. The numbers above the bars are the difference (Treatment-baseline).

Motor development was assessed using the fine motor, gross motor, and physical development subsections of the DAYC-2. All 11 participants demonstrated changes in either fine or gross motor raw scores on the DAYC-2: The differences in raw scores from pre and post assessment ranged from 0–4, 1–11, and 1–15 in fine motor, gross motor, and overall physical development, respectively (see Table 2). Three children, two with DS and one with DD, improved from below average to average range in one or more domains. Based on diagnostic category, the children with DS demonstrated the greatest average changes in raw score in every motor development subsection, followed by the participant with CP, those with ASD, and the participants with DD.

**Table 2**  
*Raw Scores on the DAYC-2 For All Participants*

Participant	Gross Motor					Fine Motor					Overall Physical Development				
	Pre	Descriptive Category	Post	Descriptive Category	Dif f	Pre	Descriptive Category	Post	Descriptive Category	Dif f	Pre	Descriptive Category	Post	Descriptive Category	Dif f
<b>Cerebral Palsy</b>															
1	10	Very Poor	15	Very Poor	5	3	Very Poor	5	Very Poor	2	13	Very Poor	20	Very Poor	7
<b>Down Syndrome</b>															
2	13	Below Average	24	Average	11	7	Below Average	11	Average	4	20	Below Average	35	Average	15
3	31	Below Average	37	Below Average	6	16	Below Average	17	Below Average	3	47	Below Average	54	Below Average	7
4	39	Below Average	40	Below Average	1	16	Below Average	19	Average	3	55	Below Average	59	Below Average	4
<b>Autism Spectrum Disorder</b>															
5	39	Average	40	Average	1	16	Below Average	16	Below Average	0	55	Below Average	56	Below Average	1
6	41	Average	43	Average	2	18	Below Average	18	Below Average	0	59	Below Average	61	Below Average	2
7	17	Average	28	Average	11	10	Average	14	Average	4	27	Average	42	Average	15
<b>Developmental Delay</b>															
8	26	Poor	27	Very Poor	1	15	Below Average	16	Below Average	1	41	Poor	42	Poor	1
9	40	Average	41	Average	1	18	Below Average	20	Average	2	58	Below Average	61	Average	3
10	39	Average	41	Average	2	18	Average	20	Average	2	57	Average	61	Average	4
11	35	Below Average	38	Below Average	3	14	Below Average	14	Poor	0	49	Below Average	52	Below Average	3

Except for the participant with CP, all of the participants showed an overall positive change in sensory processing, as indicated by movement toward the mean, representing more typical sensory processing patterns (see Table 3). By diagnostic category, the child with CP demonstrated a positive change toward the mean in 9.1% of the categories of sensory processing, showed no change in 72.7% of the categories, and moved away from the mean in 18.2% of the categories. The children with ASD demonstrated positive change toward the mean in 21.2% of the categories of sensory processing, showed no change in 64% of the categories, and moved away from the mean in 15.2% of the categories. The children with DD demonstrated positive movement toward the mean in 20.5% of the categories of sensory processing, showed no change in 68.2% of the categories, and moved away from the mean in 11.4% of the categories. Finally, the participants with DS demonstrated a positive change toward the mean in 18.2% of the categories of sensory processing, showed no change in 69.7% of the categories, and moved away

from the mean in 12.1% of the categories. Combined with motor development data from the DAYC-2, these results indicate that an aquatic developmental play group may have the potential to facilitate changes in motor and sensory processing for individual children under 3 years of age with a variety of conditions that ultimately enhance occupational participation.

**Table 3**  
*Raw Scores on Sensory Profile 2 for all Participants*

Participant	Seeking				Avoiding			
	Pre	Descriptive Category	Post	Descriptive Category	Pre	Descriptive Category	Post	Descriptive Category
<b>Cerebral Palsy</b>								
1	30	M	30	M	36	MM	31	MM
<b>Down Syndrome</b>								
2	30	M	35	MO	12	M	11	M
3	33	M	34	MO	14	M	14	M
4	28	M	27	M	16	M	17	M
<b>Autism Spectrum Disorder</b>								
5	29	M	25	M	22	MO	20	M
6	30	M	26	M	22	MO	23	MO
7	24	M	35	MO	19	M	22	MO
<b>Developmental Delay</b>								
8	33	M	35	MO	12	M	15	M
9	18	LO	18	LO	12	M	13	M
10	29	M	23	M	13	M	12	M
11	35	MO	34	MO	25	MO	27	MM

Participant	Sensitivity				Registration			
	Pre	Descriptive Category	Post	Descriptive Category	Pre	Descriptive Category	Post	Descriptive Category
<b>Cerebral Palsy</b>								
1	33	MO	33	MO	24	MO	27	MM
<b>Down Syndrome</b>								
2	17	M	14	M	12	M	13	M
3	12	LO	13	M	14	M	15	M
4	28	MO	25	M	17	M	17	M
<b>Autism Spectrum Disorder</b>								
5	26	M	23	M	21	M	19	M
6	28	MO	19	M	28	MM	28	MM
7	45	MM	32	M	24	MO	30	MM
<b>Developmental Delay</b>								
8	23	M	25	M	13	M	14	M
9	13	M	9	LO	10	M	8	LO
10	21	M	16	M	12	M	12	M
11	38	MM	31	MO	26	MO	21	M

	* = change in category toward the mean	ML = much less than others
	* = change in score, no change in category	LO = less than others
	* = change in category away from the mean	M = like majority
		MO = more than others
		MM = much more than others

Analysis of the Parent Support Survey (see Appendix A) showed positive change for the parents of these children as well. When considering the aquatic play program as an included benefit of the therapeutic services in which their children were enrolled, parental satisfaction with services increased over 20% from 76.4% satisfied to 99.2% satisfied. In addition, participation in the program decreased parental feelings of isolation from 60% to only 48%. The perceived value, or social validity, of the aquatic play program was rated at 99.3% following completion of the program. These results support the relevance of an aquatic program held in the community that attends to both the specific, individual needs of children with disabilities under 3 years of age and the needs of the parents, thus impacting the overall family unit.

### Discussion

The purpose of this study was to explore the impact of an aquatic developmental play program on the sensory processing and motor development needs of infants and children with disabilities under 3 years of age and its impact on parental isolation and satisfaction with services. The results from this study indicated developmental and functional gains for the individual participants with disabilities on standardized measures as well as individualized goals over a 9-week intervention period. In such a short intervention period, individualized goal attainment can be anticipated; however, changes in standardized assessment are more difficult to achieve in a short period. Improvements in both sensory processing areas as well as gross motor, fine motor, and overall physical development on standardized measures with established reliability and validity, such as the Sensory Profile 2 and the DAYC-2, support the effectiveness of the aquatic developmental play program. Reports from the parents of the child participants also showed that changes in assessment scores as well as meeting individualized goals in the water translated into functional gains and increased participation outside of the water.

Of the 11 participants in the study, one child was diagnosed with CP. He was an example of more time required to determine appropriate goals because of severe functional limitations as well as variable arousal levels resulting from his antispasticity medication. While improvements in postural control of the neck and trunk were observed on a day-to-day basis, overall improvement to meet expectations by the end of the study was not obtained. In contrast to our findings, an aquatic exercise training program that addressed gross motor function in children with CP indicated effectiveness following a 10-week rehabilitation protocol (Akinola et al., 2019). Given that the child with CP in this study was trending toward meeting expected performance at the end of this 9-week program, it is possible with more regulated arousal or a slightly longer intervention period that those goals may have been achieved.

Although the one participant with CP did not meet expectations on any of his individualized goals using GAS, he showed improvement in all three categories of the DAYC-2 (gross motor, fine motor, and overall physical development), second only to those participants with DS. This indicates the importance of individualizing goals using GAS in addition to using standardized measures to obtain a holistic assessment of the child's performance.

Substantial changes were indicated in the areas of parental isolation and satisfaction with services following the aquatic developmental play program. Many of the parents mentioned throughout the study that they felt the program was as beneficial for them as it was for their child. One parent stated that she enjoyed the group sessions because her child was exposed to and given the opportunity for interactions with other children, and there were “more social connections for me as well.” The parents gained an additional source of support through meeting other parents of children with disabilities away from their home. The parents were observed to socialize in the viewing area of the pool and the dressing room before

and after sessions. They were often overheard making plans to get together outside of session times for play dates and birthday parties.

The aquatic developmental program was unique in that it was designed and implemented for infants and children with disabilities under 3 years of age from an occupational therapy perspective. Increased participation in daily activities and enhanced overall occupational performance was achieved by addressing the children's motor development and sensory processing needs in a community setting. In addition, family bonding and education was achieved through incorporating the co-occupation of the parent and child interacting and playing together in the water during sessions, improving feelings of isolation and increasing satisfaction with services.

### Limitations and Future Research

This study was limited by a small sample size, short intervention period, and a lack of group comparison with follow up measurement after the 9-week intervention. While assessments and observation contributed to goal-setting, parent report of the child's functional abilities on a regular basis was used. Although parent report is helpful to gain a full picture of the child's abilities, in this study, it led to social communication and motor goals that were too ambitious. In addition, although the varied diagnoses included in this exploratory study showed the potential of aquatic therapy effectiveness in early intervention, the outcomes did not provide strong data for any one diagnosis because of the heterogeneous nature of the participants. Furthermore, re-administration of the standardized measures (the Sensory Profile 2 and the DAYC-2) in a short time frame may not accurately capture the subtle changes in the children's performance. Continued research employing a more stringent research design, including a control group and randomization, is indicated to provide further support for the effectiveness of this dynamic, engaging intervention on enhanced participation and the performance of children with disabilities.

### Conclusion

Children with disabilities under 3 years of age enrolled in EI services are varied in their strengths, needs, and diagnoses. Families of these children also have social support needs that deserve attention. Therefore, providing a therapeutic service that targets the individual goals of children with disabilities that also focuses on parental education and social participation is necessary to maintain satisfaction with services. The results of this study indicate an effective aquatic developmental play program in helping children with various conditions and limitations achieve both individual goals and demonstrate improvements on standardized assessments. The engaging, dynamic quality of the program helped these children to reach developmental goals and functional gains by using the meaningful activity of aquatic play in a community setting, two cornerstones of current occupational therapy practice.

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**Appendix A**

**Parent Support Survey**

This questionnaire is designed to assess how satisfied you are with the early intervention services you and your child are receiving and your feelings of social isolation. Please answer the questions as if the Ocean of Change program was a service provided to you as a part of your early intervention services. You are asked to answer each item on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*).

**Satisfaction:**

1. I am satisfied with the services my child is receiving through early intervention.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

2. I feel that my child is benefitting from the services my child is receiving through early intervention.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

3. Overall, I am satisfied with the progress my child is making in early intervention therapy sessions.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

4. I feel that the services provided by early intervention are of the highest quality.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

5. I do not feel that my child is missing out on any additional services or treatments.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

**Isolation:**

1. Outside of my immediate family, I feel isolated from a support group.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

2. I do not get out into the community as much as I would like since having my child.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

3. I do not have people in my life who understand the challenges of raising a child enrolled in early intervention services.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

4. I do not have many opportunities for social engagement.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

5. I feel more isolated from my peers since having my child.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

Social Validity:

1. I feel Ocean of Change was beneficial for my child.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

2. I feel like my child enjoyed participating in the Ocean of Change program.

1	2	3	4	5
Strongly	Somewhat	Neutral	Somewhat	Strongly

AQUATIC PLAY PROGRAM

disagree

disagree

agree

agree

3. I feel like my child has progressed toward his or her goals through the Ocean of Change program.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

4. I enjoyed participating in a program in the community.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

5. I feel like I have established social connections or additional support through the Ocean of Change program.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

6. I would like to continue to participate in aquatic developmental treatment for my child.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

7. Ocean of Change helped me to better understand how to help my child progress toward his or her goals.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

8. Ocean of Change helped me to feel more comfortable with my child in an aquatic environment.

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree

Please answer questions 9 and 10 freely.

9. What do you feel are the benefits of the individual sessions versus the group sessions?

10. Please give any additional comments or suggestions here. All feedback is welcome and appreciated!