



## **AOTA Critically Appraised Papers Series**

# **Evidence Exchange**

*\*A product of the American Occupational Therapy Association's Evidence-Based Literature Review Project*

### **CRITICALLY APPRAISED PAPER**

#### ***Focused Question***

**Is aquatic occupational therapy more effective than traditional land-based occupational therapy for improving functional skills for children 6 months to 7 years old with multiple disabilities?**

---

McManus, B. M., & Kotelchuck, M. (2007). The effect of aquatic therapy on functional mobility of infants and toddlers in early intervention. *Pediatric Physical Therapy, 19*, 275–282.  
<http://dx.doi.org/10.1097/PEP.0b013e3181575190>

#### **CLINICAL BOTTOM LINE:**

Children with multiple disabilities have been described as having limitations in many areas of performance. These limitations often lead to decreased functional mobility skills and restrict a child's ability to fully participate. Improvement with functional mobility can foster the development of the child's ability in the areas of sensory–perceptual, emotional regulation, cognitive, communication–social, and motor–praxis skills. Many of these skills are the building blocks of the areas of occupation such as ADLs, work, play, education, leisure, and social participation (AOTA, 2008). While the population of children with multiple disabilities is growing, one emerging trend for intervention involves “therapeutic” and “recreational” aquatic therapy (AT) programs. Recreational programs are usually provided by instructors who are not formally trained in rehabilitation techniques. The goals of this type of program include fun, fitness, and community access. Therapeutic aquatic programs are usually provided by pediatric occupational therapists and physical therapists that have been formally trained to promote therapeutic goals.

This study provides occupational therapists with evidence to support the use of AT combined with land-based therapy services to help facilitate functional mobility skills in children as outlined in the individualized family service plan (IFSP). AT offers an evidence-based treatment to use as an adjunct to traditional therapy to improve a child's physical abilities and ability to participate in occupations. However, more studies are needed with children of different age ranges and diagnoses or conditions to further lend evidence that supports AT.

#### **RESEARCH OBJECTIVE(S)**

The purpose of this study was to evaluate the effect of an AT program combined with a home-based early intervention (EI) program with physical and occupational therapy components. The

goal was to determine if the addition of AT improved a child's functional mobility, which was further defined as the child's ability to move in and out of sitting, creeping, walking on even and uneven surfaces, running, climbing stairs, and moving in and out of small chairs.

## DESIGN TYPE AND LEVEL OF EVIDENCE:

Level II  
Two nonrandomized groups (an intervention group and a control group)

### Limitations (appropriateness of study design):

Was the study design type appropriate for the knowledge level about this topic? *Circle yes or no, and if no, explain.*

YES  NO

This study was intended to expand the current literature available on the effect of AT for children with developmental and neuromuscular disabilities. The authors acknowledged the few published studies regarding the effects of recreational and therapeutic AT programs. The authors wanted to demonstrate the positive effects of AT combined with additional land-based occupational therapy and/or physical therapy to improve a child's functional mobility. However, the study did identify certain limitations, such as a small sample size and nonrandomization, which limited the study's power and generalizability.

## SAMPLE SELECTION

How were subjects selected to participate?

Children were recruited for this research project from a larger research project that was focused on examining parental perceptions of EI service delivery and differences in developmental outcomes of children with known or suspected developmental disabilities. The study randomly sampled 60 families from the project to form the control group. These families were sent letters requesting for possible participation. After comparing the respondents to the inclusionary criteria, the participants for the control group were further narrowed to 22 children. Meanwhile, convenience sampling was used to select families for the AT group. Fifteen families who were already enrolled in an AT program met the inclusion criteria for this study and gave consent to participate. The researchers allowed the difference in the number of the two groups, for power is increased with case-to-control ratios greater than 1:1.

## Inclusion Criteria

Please list.

1. Receiving home visits through EI, occupational therapy, or physical therapy.
2. Not in protective custody.
3. Having completed at least 1 EI developmental assessment before January 1, 2004, that revealed a delay in functional mobility, >1 standard deviation from the EI assessment mean.
4. Participating in 1 additional EI development assessment before May 31, 2004.

## Exclusion Criteria

Please list.

NR

**SAMPLE CHARACTERISTICS**

N = 37

# Dropouts None reported

#/ (%) Male 18/ 51.4%

#/ (%) Female 17/ 48.6%

*Note: The article did not account for the gender of 2 participants.*

Ethnicity 91.9% White, non-Hispanic

Disease/disability diagnosis Cerebral palsy (n = 4), muscular myopathy (n = 3), prematurity (n = 7), chromosomal anomaly (n = 7), myelomeningocele (n = 4), sensory system/integrative deficits (n = 4), hypotonia (n = 2), and developmental delay (n = 8).

Check appropriate group size:

<20/study group	20–50/study group	51–100/study group	101–149/study group	150–200/study group
	✓			

**INTERVENTION AND GROUP COMPARISONS**

Group 1: AT

Brief Description	The AT program was provided within the same week as the EI services, so the child received both services in the same week. When the child was in the pool, approximately half of the children had either a parent or sibling accompanying them into the water. Goals for the sessions were developed from the child’s IFSP. Some of the activities included standing play, gait training, kneeling, squatting, dynamic balance activities on floating mats, stepping activities using underwater benches, and resistive play with weighted toys.
Setting	The pool where the treatment occurred was 30’ long, 15’ wide, and 1’–2’ deep. The temperature was kept at 89 degrees.
Who Delivered?	The AT session had 1 occupational therapist and 1 physical therapist in the pool. Each therapist had 1 child with them in the water. This allowed for an individual session as well as peer socialization.
Frequency?	The AT program was once weekly in conjunction with the home program, which was also once weekly.
Duration?	The duration of the AT session lasted 30 minutes. The duration of the home program lasted 60 minutes. The duration of the research proposal lasted 36 weeks.

Group 2: Control

Brief Description	The home program was comparable to the pool program, as similar activities were utilized, and the goals being addressed were also from the child's IFSP.
Setting	The program occurred in the child's house.
Who Delivered?	The EI services were provided by physical therapists and occupational therapists.
Frequency?	EI services in the home took place once weekly.
Duration?	The duration for the EI session lasted 60 minutes. The duration of the research proposal lasted 36 weeks.

Intervention Biases:

Are any of the following intervention biases present? *Answer yes or no and explain, if needed.*

Contamination

YES  NO

Contamination did not occur because the article did not state that a member of the control group received aquatic therapy.

Co-intervention

YES  NO

The article did not mention co-intervention, as there was not any mention of the students receiving other interventions at the same time as the study treatment.

Timing

YES  NO

The researchers chose 36 weeks for the intervention to occur because the literature suggested that 24 weeks was not enough time to affect motor skills. Therefore, the researchers believed that the 9-month study would be enough time to cause a positive change in functional mobility skills. However, it should be noted that over the course of 9 months a child can improve his or her skills based on maturation.

Site

YES  NO

The study could potentially have site bias because of where the therapy occurred. While the AT program was held at the same pool, the home therapy services were held at each child's own home. Because each home was different, a bias was introduced.

Use of different therapists to provide intervention

YES  NO

Intervention bias could occur, because there were 2 different groups involved with this research. The article did not indicate if the same provider saw the same children or if the therapist rotated and treated different children.

**MEASURES AND OUTCOMES**

Complete for each relevant measure when answering the evidence-based question:

Name of measure, what outcome was measured, whether the measure is reliable and valid (as reported in article--yes/no/NR [not reported]), and how frequently the measure was used.

Mullen Scales of Early Learning ([MSEL]; Mullen, 1995): This tool is standardized and is a developmental assessment of 5 subscales, including visual-reception, receptive-language, expressive-language, fine-motor, and gross-motor skills. The Gross Motor subscale of the MSEL measured the target outcome of functional mobility. The MSEL has shown to have good interrater reliability ( $r = 0.99$ ), test-retest reliability ( $r = 0.83-0.98$ ), concurrent validity with several assessment tools, and sensitivity (77%) when identifying developmental delays and detecting change that has occurred.

### Measurement Biases

Were the evaluators blind to treatment status? *Circle yes or no, and if no, explain.*

YES NO

The MSEL is given to all the children receiving services over 6 months by their physical therapist, occupational therapist, or a developmental specialist who received training in the proper administration of the tool. Pre- and post-assessments were both completed by the primary home visit EI therapist, who also received training in administration and scoring of the MSEL. It should be noted that because of the retrospective nature of this tool, therapists were blinded to the study purpose and design.

Recall or memory bias. *Circle yes or no, and if yes, explain.*

YES NO

Because of their ages, the children in the study will not remember the information being assessed. The amount of time between assessments (6 months) is long enough to not produce a recall bias.

Others (list and explain):

It is important to recognize that this outcome measure may not be the best measure for gains in mobility for this population. A tool geared more toward this population may indicate more accurate results.

## **RESULTS**

List results of outcomes relevant to answering the focused question.

Include statistical significance where appropriate ( $p < 0.05$ ).

Include effect size if reported.

The analyses were completed with the use of SASv8.1, and the significant level was set at  $p \leq 0.05$ . The mean baseline and the subsequent age-adjusted normalized Gross Motor subscale scores were analyzed between the 2 groups using a one-tailed paired  $t$  test. The baseline scores for both groups were not significantly different ( $p = 0.16$ ). The mean change for MSEL age-adjusted normalized score is  $-2.7$  ( $SD = 8.7$ ) for the control group and  $2.8$  ( $SD = 9.3$ ) for the experimental group. The difference of  $5.2$  ( $SD = 8.9$ ) is statistically significant ( $p < 0.05$ ). Therefore, the results of this study indicated that the AT group who also received traditional EI services demonstrated a significant gain in functional mobility skills as compared to the comparison group, which only received traditional EI services.

Was this study adequately powered (large enough to show a difference)?

Circle yes or no, and if no, explain.

YES  NO

Were appropriate analytic methods used? Circle yes or no, and if no, explain.

YES  NO

Were statistics appropriately reported (in written or table format)?

Circle yes or no, and if no, explain.

YES  NO

## CONCLUSIONS

State the authors' conclusions that are applicable to answering the evidence-based question.

The authors concluded in their study that AT, in conjunction with regular occupational therapy or physical therapy land-based EI services, can have a greater positive effect on a child's functional mobility skills than EI services alone. The outcomes of the study provide promising evidence for the use of AT to promote gains in functional mobility. The authors acknowledged the single site; nonrandomized treatment allocation; and small, ethnically homogenous sample size as limitations for generalizing the results of the study. They further recommended a follow-up study that addresses these limitations.

## References

- American Occupational Therapy Association. (2008). Occupational therapy practice framework: Domain and process (2nd ed.). *American Journal of Occupational Therapy*, 62, 625–683. <http://dx.doi.org/10.5014/ajot.62.6.625>
- Mullen, E. (1995). *Mullen Scales of Early Learning: AGS edition*. Circle Pines, MN: American Guidance Service.

This work was completed in November 2012 by Lisa Sweeney, OTR/L, occupational therapist at Orange Ulster BOCES, Cornwall, New York, and graduate student in the post-professional MSOT Program at Quinnipiac University.

AOTA has determined that this CAP has met AOTA-established criteria and guidelines for research design, format, and structure. The CAP has been peer reviewed by CAP reviewers who are selected and trained by AOTA. However, the vigorous peer review process is conducted independently of the AOTA review and editorial processes.

For more information about the Evidence Exchange, e-mail [evidenceexchange@aota.org](mailto:evidenceexchange@aota.org)

CAP Worksheet adapted from Critical Review Form--Quantitative Studies. Copyright © Law, M., Stewart, D., Pollack, N., Letts, L., Bosch, J., & Westmorland, M., 1998, McMaster University. Used with permission.



Copyright © 2012 American Occupational Therapy Association, Inc. All rights reserved.  
For personal or educational use only. All other uses require permission from AOTA.  
Contact: [copyright@aota.org](mailto:copyright@aota.org)