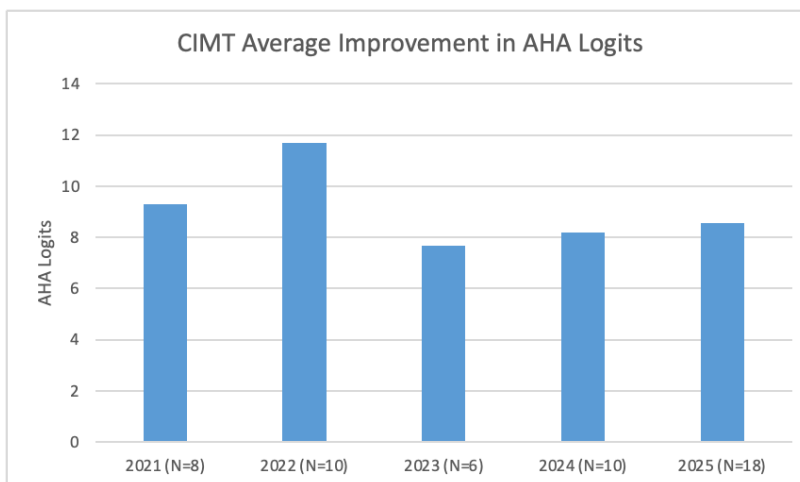


# Cleveland Clinic Children's Hospital for Rehabilitation Therapy Services

## Constraint-Induced Movement Therapy for Children With Hemiplegia or Brachial Plexus Injury

Constraint-induced movement therapy (CIMT) is an innovative, scientifically supported method of upper extremity rehabilitation for children with neuromotor impairments, such as hemiplegia from cerebral palsy or pediatric stroke. CIMT involves constraint/casting of the nonaffected upper extremity in combination with intensive therapy. Therapy consists of three weeks of intensive outpatient occupational therapy services for five days per week, three hours per day.

Pre- and post-assessments include the Assisting Hand Assessment (AHA). The AHA measures how effectively children with unilateral hand dysfunction use their involved hand collaboratively with their well-functioning hand to perform bimanual tasks. The logit-based 0-100 AHA-unit scale was used to obtain this data. Treatment courses and outcomes for these patients are summarized below in logit-based AHA units.



Data indicate gains for patients in 2025, with a mean increase in logit-based AHA units of 9.1. An increase of at least 4 AHA logits is considered clinically significant. Since 2021, 51 out of 52 patients demonstrated an increase in their logit scores, and 47 out of 52 patients demonstrated a clinically significant change.

### Constraint-Induced Movement Therapy Summer Camp

The groups followed the CIMT protocol for one week, followed by two weeks of the Hand-Arm Bimanual Intensive Therapy (HABIT) protocol. Children participated for three hours a day, five days a week, for three weeks (45 total treatment hours). During the first week, children wore casts on their unaffected side to encourage use of their affected side. The cast was removed after one week, followed by two weeks of bimanual and ADL training. Participants included children with cerebral palsy and pediatric stroke who had previously received individual CIMT. From 2021–2025, 33 children participated in the CIMT/HABIT groups.

From 2021-2025, all children completed pre- and post-measures, including the Box and Blocks Test, grip strength, active shoulder range of motion, quadruped weight-bearing, and the AHA. The Box and Blocks Test measured how many blocks a child could move in one minute, from one side of a partitioned box to the other, using their affected limb. Grip strength was measured in pounds using a dynamometer. Shoulder range of motion was measured in degrees using a goniometer. Quadruped weight-bearing was measured in seconds. The AHA is a criterion-referenced assessment of how effectively the affected hand and arm are used in bimanual tasks. The chart below summarizes outcomes for the CIMT summer camps.

### CIMT/HABIT Summer Camp Outcomes | 2021-2025 (N=33)

Year	N	Box and Blocks	Grip Strength	Shoulder Flexion	Quadruped Weight-Bearing	AHA
2021	6	5.17	1.35	5	0	6.83
2022	5	6	2.48	0	0	8
2023	8	3.38	3.49	1.38	7.5	7.88
2024	7	6	-1.2	5	15.9	7.29
2025	7	4.29	2.28	7.14	0.14	4
2021-2025 average gain	Total: 33	4.85	1.2	3.82	5.21	6.76

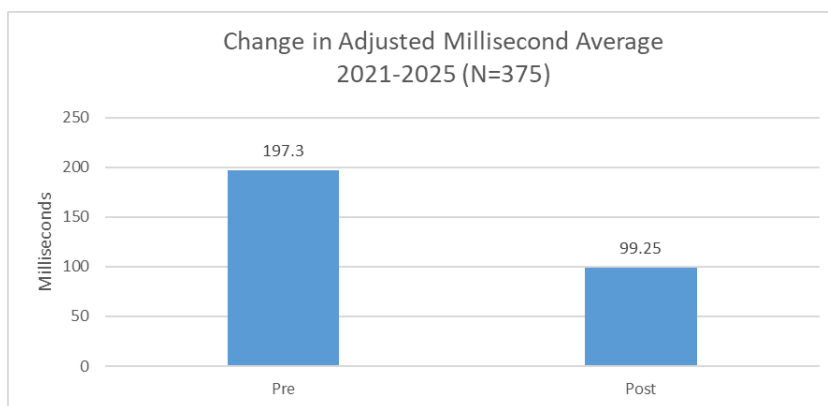
The zero for shoulder flexion indicates the participants had full range of motion at the beginning of camp. The zero for quadruped weight-bearing indicates these participants began the group with maximum performance. An increase in at least 4 AHA logits is considered clinically significant, and the average increase in logit score for CIMT/HABIT summer programs 2021-2025 was 6.76.

### Interactive Metronome for Motor Control and Coordination

Therapy Services offers Interactive Metronome® (IM), a computer-based program run by occupational therapists to improve attention, motor control and coordination in children with a wide range of cognitive and physical difficulties related to reaction speed and timing.

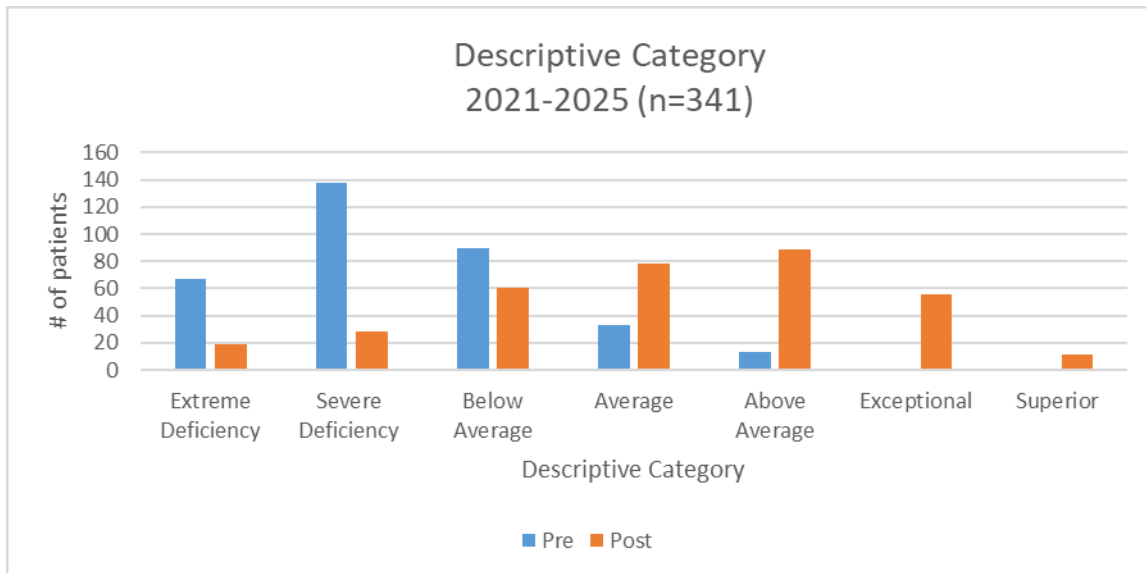
IM can benefit children with learning disabilities, dyslexia, apraxia, ADD/ADHD, auditory/language processing disorders, developmental coordination disorder, cerebral palsy and traumatic brain injury.

The IM assessment is administered before treatment and at discharge. Analysis of patient scores from 2021 to 2025 shows an average reduction of 98.05 points in the adjusted millisecond score from baseline to discharge. Lower scores indicate better motor coordination.



The IM assessment tool consists of seven descriptive categories of performance for children ages 6 and older: extreme deficiency, severe deficiency, below average, average, above average, exceptional and superior. The graph below summarizes group data for patient performance on the IM assessment. From 2021 to 2025, 86% of the 341 patients assessed showed improvement, with an average increase in performance of 1.8 levels above baseline testing.

The following graph indicates that the majority of children began the program with deficits and completed the program with improved performance.



## Torticollis

Torticollis, neck tightness presenting as asymmetrical positioning, is often categorized as congenital muscular torticollis or positional torticollis. Congenital muscular torticollis (CMT) is evident shortly after birth and is associated with birth trauma or in-utero positioning. It results from shortening or excessive contraction of the sternocleidomastoid muscle in the neck. Positional torticollis typically appears within the first few months after birth and is usually caused by asymmetrical positioning during sleep or supported sitting. Infants with either type present with reduced cervical range of motion and an asymmetrical head or neck position.

Since June 1, 2017, 3,381 children diagnosed with torticollis have received physical therapy evaluations. Of these, 56% had left-sided torticollis and 44% had right-sided torticollis. A total of 1,680 patients were screened for comorbidity at the time of evaluation.

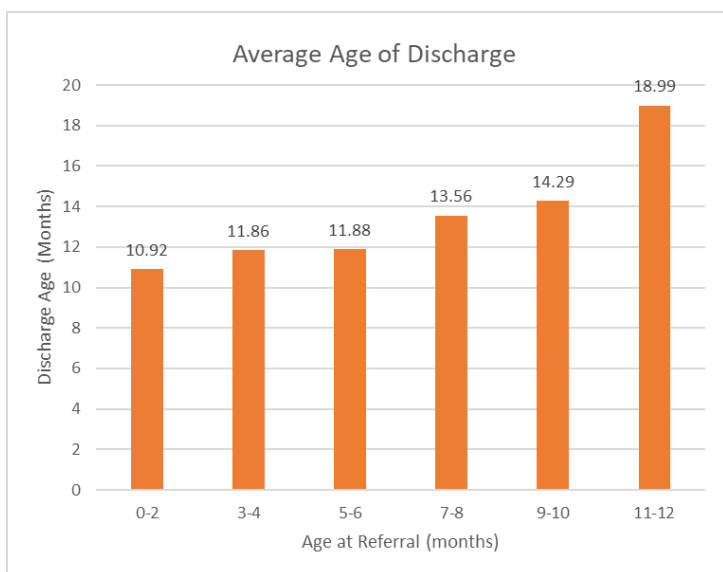
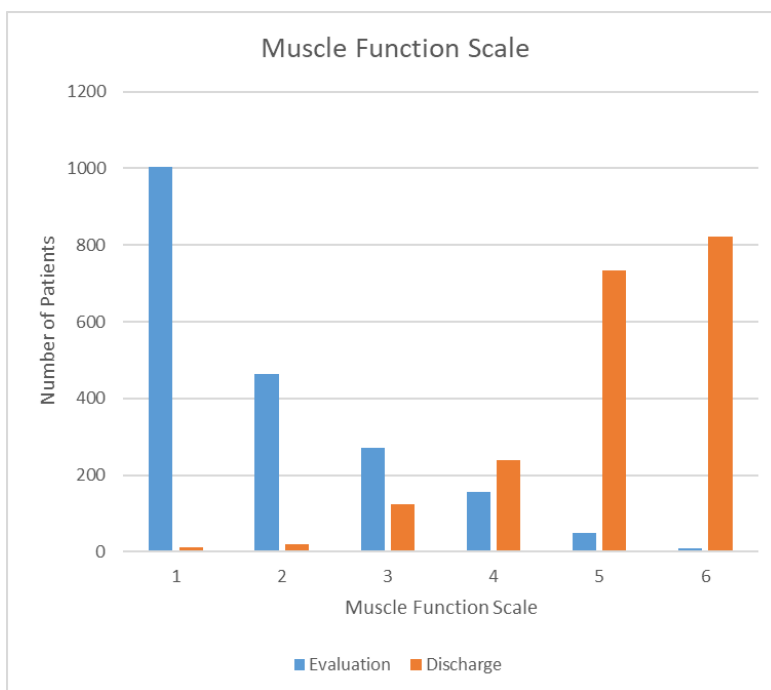
Comorbidity (screened at evaluation, N= 1,680)	Value
Breech presentation	22.6%
Reflux	50.4%
Hip dysplasia	2.0%
Multiple births (evaluations)	16.0%
Tongue tied	18.8%
Delivered with vacuum extraction or forceps	13.7%

Of the total patients, 1,951 had completed treatments (evaluation through discharge). For this data, inclusion criteria included a diagnosis code of M43.6 (torticollis, unspecified) or Q68.0 (congenital musculoskeletal deformities of sternocleidomastoid muscle), less than age 13 months at the time of the initial evaluation, and pre- and post-assessments including the Muscle Function Scale (MFS), a measure of head righting and cervical range of motion.

### Muscle Function Scale

- 1 = Head below the horizontal
- 2 = Head in the horizontal
- 3 = Head slightly over the horizontal
- 4 = Head high over the horizontal but below 45°
- 5 = Head high over the horizontal, over 45°
- 6 = Head very high over the horizontal

The MFS is a tool used to assess the function of the lateral flexors of the neck in infants, using a scale of 0 to 6, with higher scores indicating better muscle function. A favorable outcome for the MFS is a grade 6. A total of 1,737 patients had an MFS of 1, 2 or 3 at initial evaluation. Upon discharge, 1,797 patients achieved grades 4, 5 or 6. Of those patients, 823 improved to the highest grade (grade 6). These numbers indicate that 42.2% of patients had the best possible outcome. Most patients start therapy with an MFS of grade 1 and by discharge from physical therapy services are grade 6. The mean improvement of MFS was 3.24, an improvement of 3.25 grades.



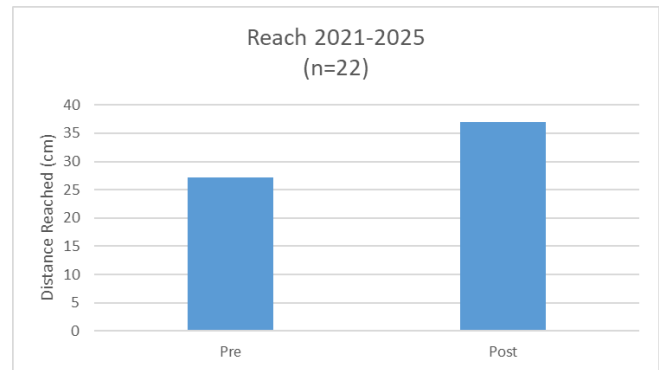
Since 2017, 83.9% of torticollis referrals occurred within the child’s first four months of life, and 51.1% occur in the 0–2-month age range. Earlier referrals help support the claim that earlier access to care results in younger age at discharge. Based on the above inclusion criteria, the average age at referral was 3.52 months and average age at discharge was 11.33 months.

Sargent B, Coulter C, Cannon J, Kaplan SL. Physical Therapy Management of Congenital Muscular Torticollis: A 2024 Evidence-Based Clinical Practice Guideline From the American Physical Therapy Association Academy of Pediatric Physical Therapy. *Pediatr Phys Ther.* 2024 Oct 1;36(4):370-421. doi: 10.1097/PEP.0000000000001114

## Water Warriors for Strengthening, Stretching and Balance

Water Warriors is an eight-week aquatic physical therapy group for children ages 12-16. It includes gentle rhythmic exercises, yoga poses, breathing techniques and balance activities. Children who may benefit have diagnoses such as physical deconditioning, lack of coordination, polyarthralgia or Charcot-Marie-Tooth disease.

Each session is 45 minutes and is designed for children with difficulty in higher-level balance, body awareness and/or coordination. Pre- and post-assessments include the Timed Up and Go (TUG) test, single-leg balance, and the Functional Reach Test (Pediatric Reach Test).

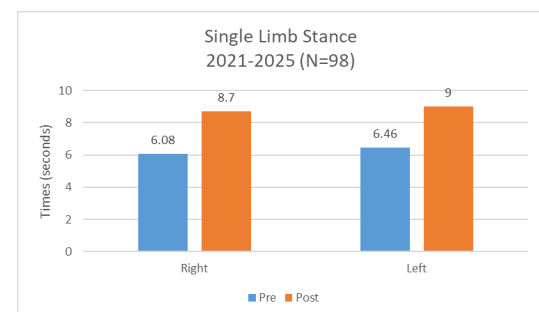
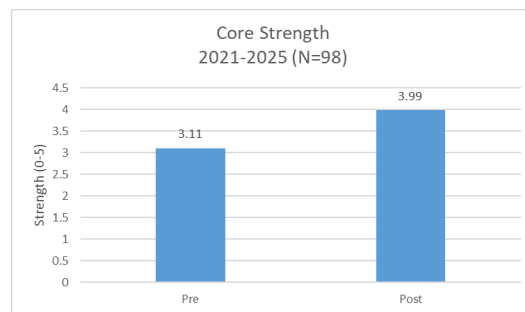
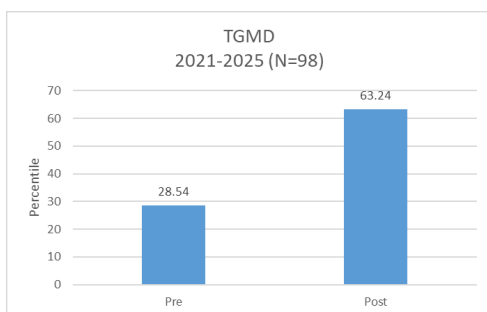


The average age for Water Warriors participants in 2021-2025 was 13.9 years, and the average functional reach for children ages 13-15 was 32.3 cm. Of the 22 participants, 86% improved their functional reach, with an average increase of 9.67 cm. The average reach at the end of the group was 36.91 cm. These results indicate improved flexibility, with participants demonstrating above-average functional reach for their age by the end of the group.

## Master Movers Balance and Coordination Group

Master Movers is a group for children ages 4-7 who demonstrate difficulty with balance, coordination, ball skills and core strength. This group focuses on peer modeling and practice of gross motor skills, such as hopping, skipping and throwing/catching. Physical therapists design a home exercise program to encourage practice in the home environment and use child-friendly yoga poses, games and obstacle courses.

Pre- and post-assessments were obtained using the Test of Gross Motor Development-2 (TGMD-2) as well as single-limb stance measured in seconds and core strength according to Helen J. Hislop and Jacqueline Montgomery's Manual Muscle Testing Procedure. An increase in percentile, raw score or standard score indicates improved gross motor skills.

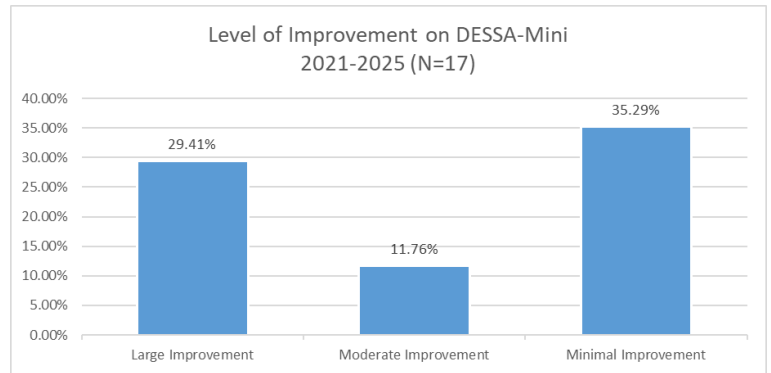


From 2021 to 2025, the average improvement for gross motor percentile was 34.7%, and the average change for core strength was 0.88 manual muscle strength grade. Average change in single-limb stance was 2.54 seconds on the left leg and 2.62 seconds on the right leg.

## Mindful Movement for Coping and Relaxation

Therapy Services offers a six-week Mindful Movement program for children ages 5-12, run by occupational therapists. The program is geared toward both current patients and children in the community who could benefit from developing coping skills and relaxation strategies. The program uses deep breathing, movement, focus and relaxation techniques to promote positive coping and self-regulation. Pre- and post-assessments were administered using the Devereux Student Strengths Assessment-Mini (DESSA-Mini). The DESSA-Mini can be used to screen for and monitor progress in the acquisition of social-emotional competencies. The graphs below summarize group data for patient performance on the DESSA-Mini.

A large improvement is defined as a T-score increase of 8 or more, indicating the interventions are working well. From 2021 to 2025, 17 participants were in the program, and 76.46% showed improvement. Of those, 29.41% demonstrated a large improvement in their DESSA-Mini score.



## Social Thinking Camp



Therapy Services offers a pragmatic language skills group using the Incredible Flexible You Social Thinking Curriculum®. The goal is to help children learn and build social communication skills to interact effectively at home, in school and within their daily environments.

The group is led by two speech therapists trained in the Social Thinking Curriculum.

Participants attend once a week for 60-minute sessions over seven weeks.

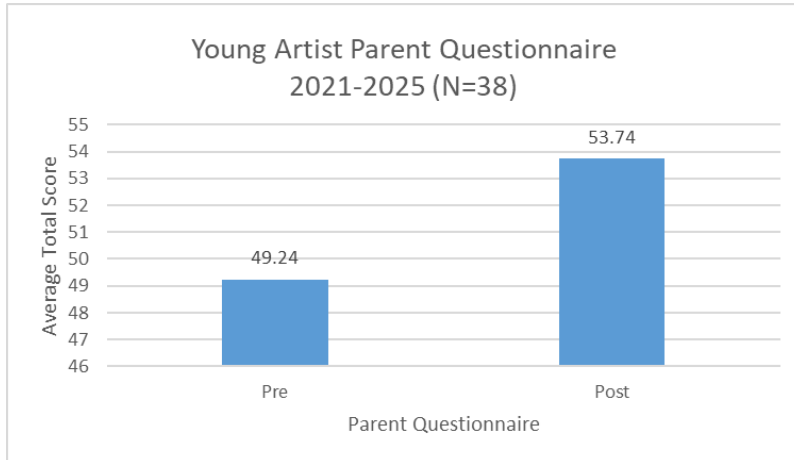
The camp is for children ages 5-7 and

9-11 who have difficulties with social interactions, including those with diagnoses such as autism, ADHD, Down syndrome and speech disturbance disorder.

Pre- and post-test data are collected using the Clinical Evaluation of Language Fundamentals-5 (CELF-5) Pragmatic Profile, a standardized parent questionnaire that assesses pragmatic language skills.

From 2021 to 2025, 38 patients participated in the group. The average scaled score improvement was 0.79.

## Young Artists



Young Artists is an eight-week art group facilitated by occupational therapists for elementary-age children. Each one-hour session focuses on learning about a famous artist and recreating one of their works. Through participation, children build fine-motor, leisure and social skills. Common participant diagnoses include autism, behavioral concerns, sensory processing disorder, anxiety, social skill deficits, and lack of coordination. At the end of the program, artwork is displayed in an exhibit for families to view.

Pre- and post-assessments use the modified Home & Community Social Behavior Scales. From 2021 to 2025, among the 38 participants, the average improvement on this measure was 4.5.

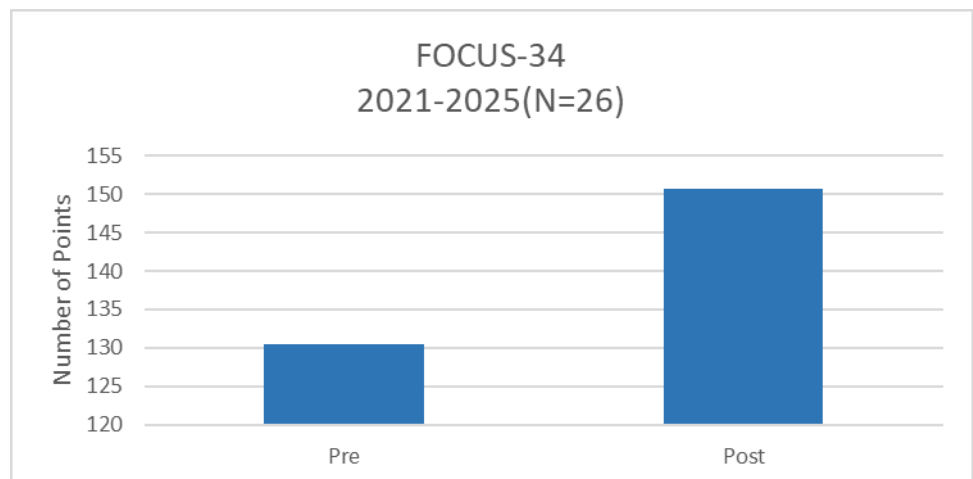
## Preschool Language and Play Group

The Preschool Language and Play Group (PLPG) is a theme-based speech therapy group for children ages 3-5 with expressive and/or receptive language delays. The group meets once a week for eight weeks and is led by a speech-language pathologist.

Pre- and post-assessments are administered using the Focus on the Outcomes of Communication Under Six (FOCUS©-34), a tool that evaluates a child's communication and interaction in real-world situations. The FOCUS-34 questionnaire is completed by a parent before and after intervention. An increase of at least 11 points is considered a clinically significant change per test guidelines.

The average improvement on the parent form was 20.08 points. Overall, 88.5% of participants showed improvement, and 65.4% of those changes were clinically significant.

Cunningham BJ,  
Rosenbaum P, Nepotiuk  
A, Thomas-Stonell N.  
Interrater Reliability of  
the FOCUS-34: Parent-  
to-Parent and Parent-to-  
Clinician. *Communication  
Disorders Quarterly*.  
2024;45(2) 135-  
138. doi: 10.1177/  
15257401221146491



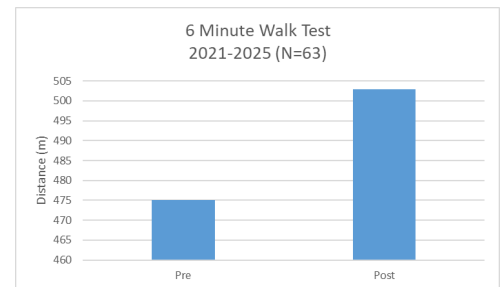
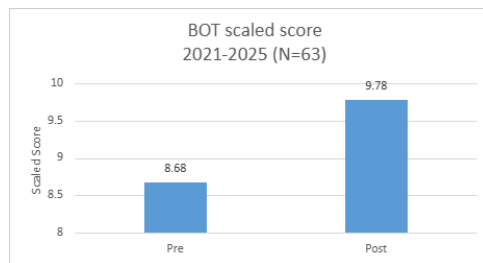
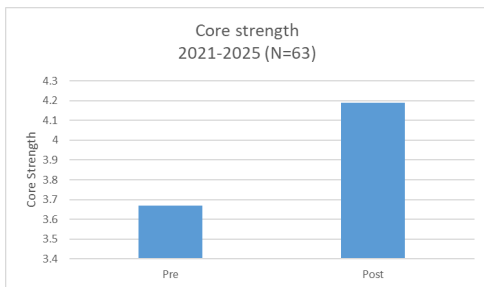
## Gym Class Heroes

Gym Class Heroes is a group led by physical therapists for children ages 9 and older with decreased strength, limited endurance and low activity levels. The program focuses on whole-body strengthening, endurance and increasing daily activity through strength training, stretching, yoga, aerobic exercise, breathing techniques and conditioning.

Many participants also attend the Cleveland Clinic Be Well Kids Clinic, which focuses on managing health concerns related to excess weight, improving quality of life and promoting overall wellness.

Pre- and post-assessments included the Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (BOT-2), as well as the six-minute walk test (measured in meters) and core strength assessed using Helen J. Hislop and Jacqueline Montgomery's Manual Muscle Testing Procedure. Improvements in scaled scores, distance and core strength indicate gains in gross motor skills.

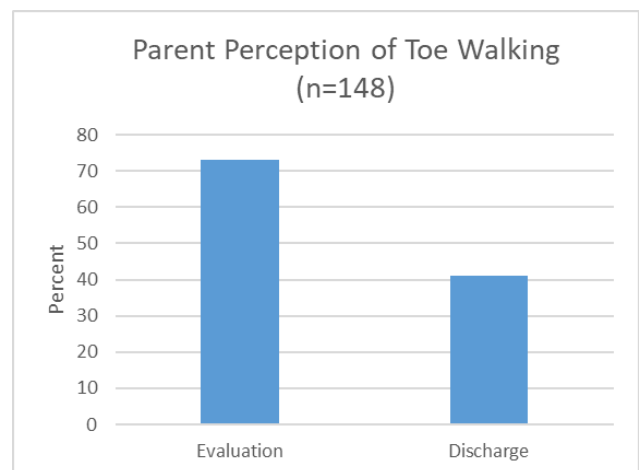
The average BOT-2 scaled score increased by 1.1, the six-minute walk distance increased by 27.78 meters, and core strength improved by 0.52.



## Toe Walking

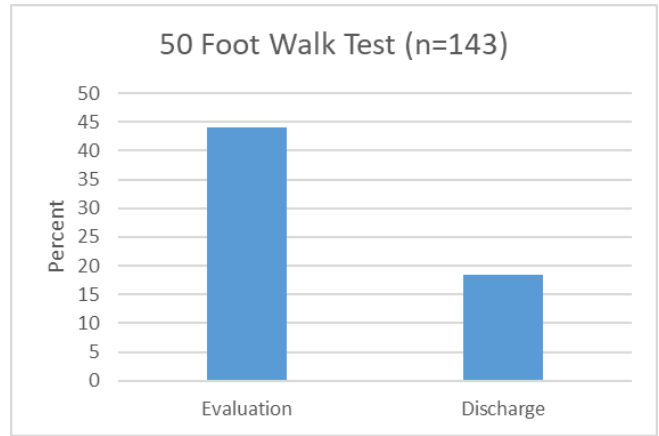
Toe walking is a diagnosis of exclusion given to children who continue to walk on their toes at an age when heel-toe gait should be established. Since 2022, physical therapists at Cleveland Clinic Children's Therapy Services have been collecting outcomes on this specialty diagnosis. As part of this outcome collection, ankle strength and range of motion is measured using the goniometry protocol created by Cynthia Norkin and D. Joyce White. Improvement was noted bilaterally for plantarflexion and dorsiflexion strength as well as bilaterally for dorsiflexion range of motion.

Additionally, parents were asked what percentage of time their child spent walking on their toes. At the initial evaluation, parents reported an average of 73.16% of time spent toe walking. Upon discharge from physical therapy, the parent-reported perception was 41.18%, a decrease of 31.98% from baseline. The sample size was 148 patients.



Physical therapists clinically assess the extent of toe walking by using the 50-Foot Walk Test (50-FWT), which uses an accelerometer for children age 6 and older. For greatest accuracy in children under age 6, video analysis and observation can be used in place of the accelerometer. At evaluation, the average toe-walking percentage for the 50-FWT was 44.06%. At discharge from physical therapy, the average percentage was 18.32%, showing a 25.74% decreased incidence of toe walking.

Based on the child's performance on the 50-FWT, a toe-walking severity grade from 1 to 6 is assigned. The sample size was 143 patients. After physical therapy intervention, the overall severity grade improved by 1.42 from the initial evaluation. These scores indicate an overall decrease in the frequency and severity of toe walking in these patients' everyday life.

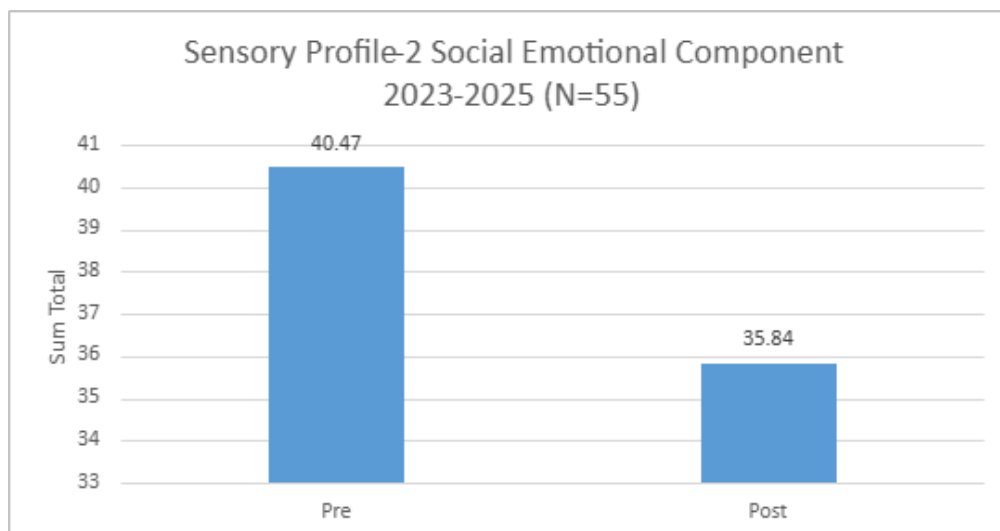


Norkin CC, White DJ. Measurement Of Joint Motion: A Guide To Goniometry. United States: F.A. Davis, 2016.

## SET for Success

Sensory and Emotional Tools (SET) for Success is a group run by occupational therapists for children ages 4-10. This four-week group educates children on a range of emotions, including fear, anxiety and anger. The program helps children understand the purpose of feelings and reactions and provides sensory and emotional tools to improve coping skills. Coping strategies include yoga, breathing techniques and mindfulness. Children and parents or caregivers are provided with various materials and activities for use in the home and community settings.

Pre- and post-measurements for the 55 participants (2023-2025) were obtained using a modified Sensory Profile 2 assessment. The average score was 40.47 at the beginning of the group and 35.84 at the end of the group, showing an improvement of 4.63.



## PEERS®

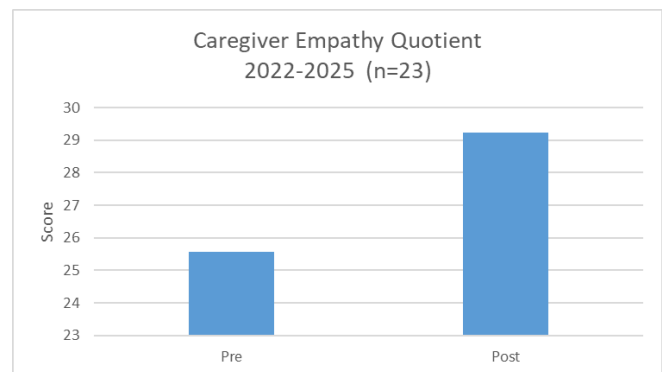
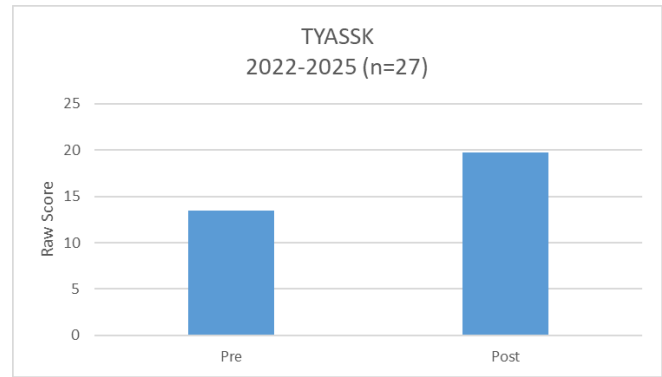
PEERS® for Young Adults is an evidence-based social skills intervention led by occupational therapists for motivated young adults ages 18-25 who want to make and keep friends and/or develop dating relationships. Participants may have autism spectrum disorder, developmental delay, intellectual disability, Down syndrome or other conditions that impact social skills.

Young adults and their social coaches (a parent or other caregiver) attend 16 weekly 90-minute group sessions. Social skills are taught through lessons and role-play, with opportunities to practice during group activities. Social coaches are trained to support young adults in building and maintaining friendships and dating relationships.

At the beginning of the group, participants complete the Test of Young Adults Social Skills Knowledge (TYASSK), a 30-question quiz that assesses social skills knowledge. Higher scores indicate greater knowledge. A total of 27 participants completed the group. The average score increased from 13.44 at baseline to 19.74 at the end, a 6.3-point improvement. Previous research shows PEERS for Young Adults typically results in a 6-8 point increase on the TYASSK.

At the beginning of the group, caregivers complete the Empathy Quotient (EQ), a 40-item questionnaire that assesses empathy in adults. The EQ was developed by Simon Baron-Cohen at the Autism Research Centre (ARC) at the University of Cambridge. Scores are used to assess levels of social impairment in people with conditions like autism, with higher scores indicating improved empathy.

A total of 23 participants completed the group. **The average score increased from 25.58 at the beginning to 29.23 at the end, a 3.65-point improvement.**



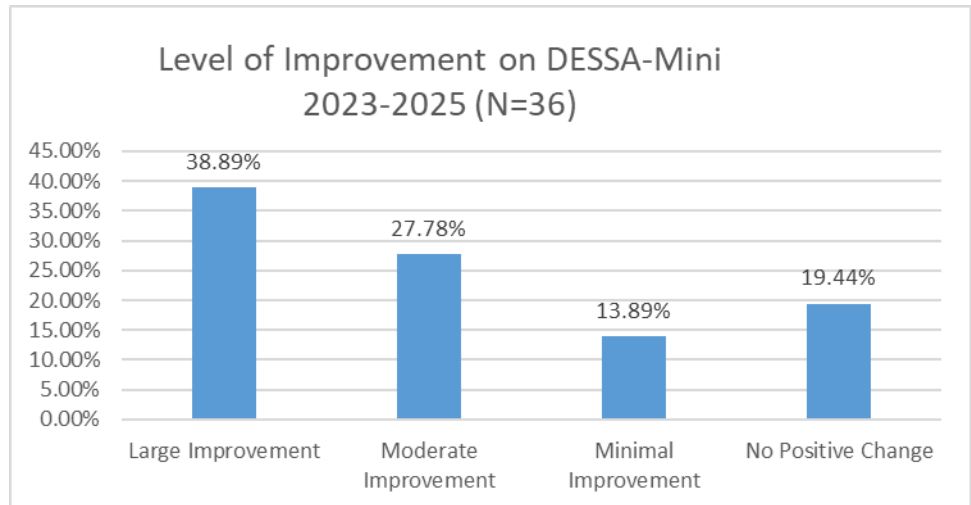
Laugeson EA. PEERS for Young Adults: Social Skills Training for Adults with Autism Spectrum Disorder and Other Social Challenges. New York, NY: Routledge, 2017.

## Game Break

Game Break is a six-week group led by occupational therapists that focuses on developing age-appropriate leisure participation for children ages 4-11. Research shows that participation in leisure activities can positively impact self-esteem, social interaction and overall life satisfaction. The group uses board games and other interactive games that can be played at home.

Pre- and post-assessments are administered using the Devereux Student Strengths Assessment-Mini (DESSA-Mini), which screens and monitors progress in social-emotional competencies.

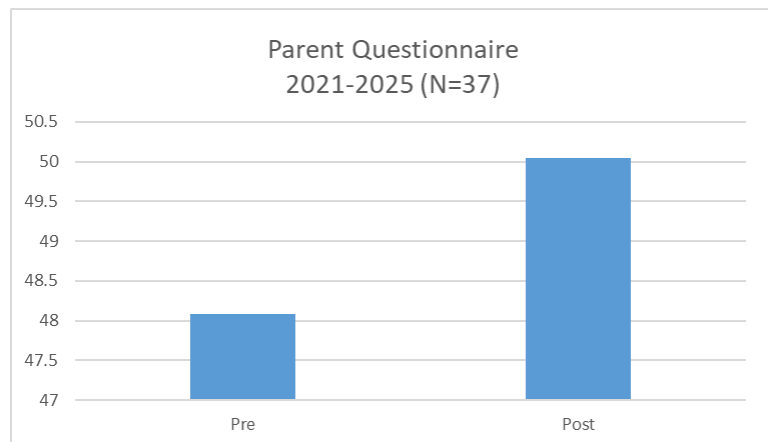
The graphs below summarize group performance on the DESSA-Mini. A large improvement is defined as a T-score increase of 8 or more, indicating the interventions are working well. From 2023 to 2025, 36 participants were in the program, and 80.56% showed improvement. Of those, 38.89% demonstrated a large improvement in their DESSA-Mini score.



## Green Thumbs Up

Green Thumbs Up is a garden-themed group led by occupational therapists for children ages 6-10. This group places an emphasis on the development of positive leisure interests. Sessions run for seven weeks and focus on planting and caring for various herbs and vegetables, creating garden-themed crafts, and participating in nature activities. Children learn the benefits of eating healthy foods, participating in outdoor sensory activities, and working together as a team to care for their garden.

The graph below summarizes performance data based on parent responses to a questionnaire assessing a child's ability to participate in group activities by following directions, collaborating with others and engaging in social skills. In 2021-2025, there were 37 participants in the program. The average total score was 48.08 at the beginning of the group and 50.05 at the end of the group, showing an improvement of 1.97 points.

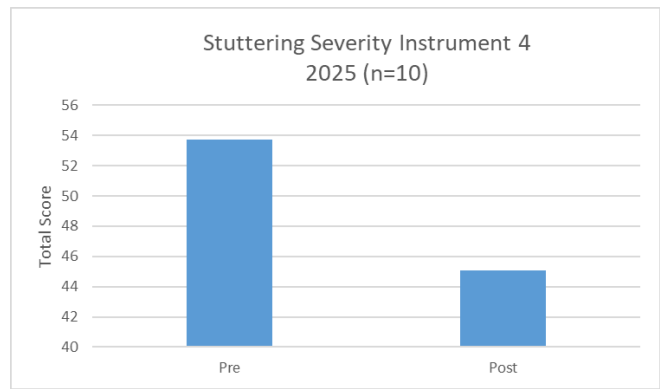


## Fluency Friends

Fluency Friends is a group led by speech therapists that encourages the use of fluency strategies in natural and group settings. Participants practice these strategies with peers to build social-emotional skills and speak with greater confidence. The goal is to help kids identify and apply tools to improve fluency in a friendly, comfortable environment. This group meets once a week for six weeks for children ages 9-11.

Pre- and post-assessments are conducted using the Stuttering Severity Instrument, Fourth Edition, a standardized measure of stuttering in children and adults. It evaluates four areas: frequency, duration, physical concomitants and speech naturalness. A decrease in total score shows positive change in overall fluency.

This group included 10 participants. The average score decreased from 53.7 at the beginning to 45.1 at the end, an improvement of 8.6 points.



## KINDL and Kiddy KINDL Quality-of-Life Measure

The KINDL is a brief, reliable questionnaire used to measure health-related quality of life in children and adolescents ages 3 and older. It includes 24 items across six areas: physical well-being, emotional well-being, self-esteem, family, friends and daily functioning. The standard KINDL is designed for ages 7-17, while the Kiddy KINDL is used for children ages 3-6.

In 2024, Therapy Services began using the KINDL quality-of-life measure for all appropriate groups and specialty programs. Across 2024 and 2025, 153 patients participated. Of these, 84 completed the Kiddy KINDL pre- and post-group, and 69 completed the KINDL pre- and post-group.

The graphs below show the change in total scores for both measures. The KINDL showed an average improvement of 2.96 points, while the Kiddy KINDL showed an average improvement of 1.40 points. These results indicate an overall improvement in quality of life following participation in our groups.

