Final Assessment/Evaluation Report

2022-2023 School Year

Final Assessment/Evaluation Report
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Introduction

Methods

Developed in rigorous clinical trials, Allegro Foundation compiled a comprehensive in-class assessment, the PF Scale © with a multivariate track to analyze the cognitive, physical, and social development of 700+ enrolled students with disabilities annually.

Administered by highly trained instructors twice per year: once at the beginning and during the last class, the standardized PF Scale measures receptive and expressive language growth, phonological awareness, sequencing/pattern skills, executive functioning, attention span, gross motor skills, posture, range of motion, dexterity, bilateral coordination, and social development. The initial round of assessments was conducted during September and October 2022, and final assessments were administered approximately 30 weeks into the session during May 2023.

Upon completion of the entire assessment battery, student forms were scored and entered into Allegro's database for review and analysis. Statistical reporting was conducted in IBM's SPSS tool, utilizing correlation, regression, repeated measures t-tests, and multivariate analysis of variance. Circle composition was scored based on criteria published in the Buktenica Developmental Test of Visual-Motor Integration, 6th Edition (BEERY VMI), while other measures were rated in an original scoring procedure with rubric available by request. Allegro instructors were then notified of areas of improvement and weakness for individual students with disabilities, while curriculum and/or program elements were modified to ensure that all participants continue to excel in Allegro's movement education programs.

Instrument

A multi-dimensional, interactive assessment, the PF Scale, captures a series of distinct subscores to maximize the validity of the instrument across the cognitive, communicative, physical and social domains. Triangulation of data from several measures, which creates substantial overlap between measures of communication and cognition for example, is key for instructors to distinguish variability in skills for specific subsets of children with disabilities. Three separate instruments were administered during the 2022-2023 school year: a preschool assessment for Allegro's youngest students at risk with unidentified disabilities, an elementary-age assessment for those in elementary programs and community outreach classes, and a low-functioning/non-verbal tool for Allegro's students with disabilities. Precautions must be made when interpreting results from various groups of children with disabilities, as complications experienced by those who live with autism, visual, or hearing impairments may render distinctions between communicative and cognitive growth unclear.

It is important to note that the development of skills measured by the PF Scale represents a continuous and cumulative process, emphasizing the importance for repeated monitoring throughout the school year. Allegro's instruction builds on previously acquired knowledge and skills, while also evoking concrete structural changes in learning and cognition.

Instrument Development

In 2010, following the initial assessment construction, multiple item analyses were completed to identify those crucial subdomain components that form three internally consistent scales for comprehensive evaluation.

An initial assessment draft was administered to a sample of 124 Allegro Foundation students with disabilities, and resulting items which did not statistically "hang together" were categorically purged and/or replaced. Failure to intercorrelate indicated that previously selected items did not represent a common underlying construct. These measures of internal consistency, as produced by coefficient alpha (Cronbach), operated as a direct function of both the number of items per subdomain as well as their magnitude of intercorrelation.

Item analysis revealed solid internal consistency for the **Cognitive Development Subscale** (measuring receptive/expressive language, anatomy, letters, phonological awareness, sequencing/patterns, executive functioning, attention span, and spatial relations) with a **Cronbach alpha coefficient of .864** after a single, flawed item had been removed in 2010. The core instrument has remained unchanged since 2010.

While the Physical Development Scale indicated lower consistency due to the diverse disabilities of Allegro's students, a .765 Cronbach alpha coefficient in the 2010 analyses indicated that the testing elements of the subscale should be retained.

As all PF Scale testing was conducted by Allegro instructors, interrater reliability analysis, as measured by Cohen's kappa, was imperative to ensure that testers acquired the same results within a predetermined margin of error. **Allegro's instructors received intensive training prior to administering the assessment, and the resulting interrater reliability for instructors in the 2021-2022 dataset was exceptionally high at Kappa = .909 (p <.005), 95% CI (.92, 1.00).** Allegro also instituted numerous controls to prevent bias of the data, including requiring instructors to submit assessments immediately upon completion and the maintenance of restricted access to data to prevent inflation of student scores. It is important to note that most assessments were conducted by the same Allegro instructor for all programs.

Confirmatory Factor Analysis of the PF Scale indicated that predicted items load on the appropriate subdomains (Cognitive, Physical, Social), validating Allegro's assessment measure as an effective means for quantifying improvement in children with disabilities.

Results

Final results as measured by Allegro's PF Scale are reported within this report. Each of Allegro's more than 700 students with disabilities evidenced significant improvements in all three domains through Allegro's free movement education instruction. Results are broken down by administered instrument based on child's age group and observed adaptive functioning: (1) preschool, (2) elementary/community outreach, and (3) low-functioning/non-verbal assessment forms. Detailed case studies of Allegro students with disabilities have been included in addition to commentary regarding research implications of our findings.

Overview Results: Elementary/Outreach PF Scale

Accurate quantitative measurement of a child's unique abilities and skillsets on the cognitive, physical, and social/emotional domains cannot be reflected in a one-size-fits-all assessment model, particularly when characterizing those with moderate-to-severe

disabilities. Upon enrollment, Allegro's teachers determine which instrument best aligns with each child's current level of functioning to best capture growth and development manifested in the foundation's weekly movement education classes.

More than one-third of enrolled students with disabilities who completed the PF Scale assessment receive the Elementary/Outreach PF Scale (n = 107), which includes open-ended questions and additional elements on the anatomy/body awareness scale with an elementary to adult age perspective (see appendix for example of Elementary/Outreach instrument).

High-level reporting of strongest areas of improvement across all participants on the Elementary/Outreach PF Scale

Cognitive Scale Item	Average Pre-Score	Average Post-Score	Df	Sig. (2-tailed)
Letter Recognition	.589	.8966	105	.01
Letter Sounds	.434	.759	105	.01

Fine Motor/Dexterity	Average Pre-Score	Average Post-Score	Df	Sig. (2-tailed)
Circle Score	1.952	2.189	105	.005
Pencil Grasp	5.519	6.837	105	.005

***details provided throughout the report on each subset measure and their implications for future academic achievement and adaptive functioning*

Overview Results: Preschool PF Scale

Seventy-seven preschool students enrolled in Allegro's weekly movement education classes were assessed using the PF Preschool Instrument. High-level reporting of strongest areas of improvement across all participants on the Preschool PF Scale included letter recognition, phonological processing, and spatial relations/awareness in a robust education-focused movement program.

Cognitive Scale Item	Average Pre-Score	Average Post-Score	Df	Sig. (2-tailed)
Anatomy Recognition	.664	.882	142	.005
Letter Recognition	.437	.507	142	.005
Letter Sounds	.392	.503	142	.005
Emotion Recognition	.412	.557	142	.005

Physical Scale Item	Average Pre-Score	Average Post-Score	Df	Sig. (2-tailed)
Spatial Relations/Navigation	.452	.566	142	.005
Range of Motion	3.187	4.823	142	.005

***details provided throughout the report on each subset measure and their implications for future academic achievement and adaptive functioning*

Overview Results: Low-Functioning/Non-Verbal Scale

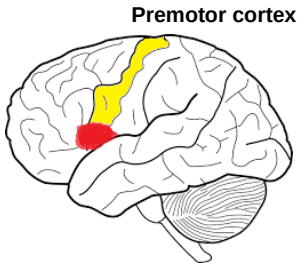
Allegro Foundation's students with disabilities whose cognitive scores are determined to score at below baseline for the Elementary/Outreach or Preschool instrument are administered the separate low-function/non-verbal instrument with emphasis on receptive language, fine and gross motor skills, and consistent interaction with instructors and peers. Increased attention span, in addition to recognition of social cues, heightens the ability for students with disabilities to learn in a classroom setting, following movement education instruction. 112 students with disabilities presented the following scores on the Low-Functioning/Non-Verbal PF Scale:

Cognitive Scale Item	Average Pre-Score	Average Post-Score	Df	Sig. (2-tailed)
Working Memory/ Sequential Order	2.841	4.672	111	.001
Range of Motion	3.267	3.931	111	.001

PF Scale: 2023 Final Report
PART I: COGNITIVE DEVELOPMENT

Receptive/Expressive Language Development

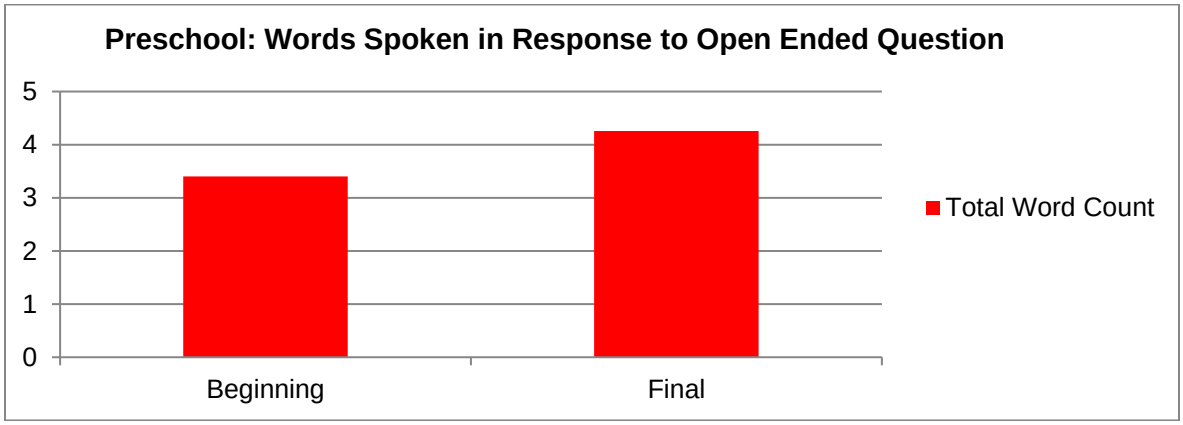
Receptive and expressive language skills are absolutely essential in the day-to-day functioning of ALL children. Without meaningful language (whether it be through gesture, vocalization, or complex sentences), children will struggle to communicate their basic needs in school and experience many obstacles in future educational learning.



Allegro's movement education techniques target all aspects of language development. In fact, fMRI research credits **Broca's area (red)**, a region in the cerebral cortex of the human brain responsible for both language comprehension and production, as playing a crucial role in encoding bodily movements. By performing Allegro's movement techniques, students with disabilities are activating their Broca's areas and providing neural stimulation directly onto the language centers of their brains.

Over the course of more than 26 weeks, Allegro's free classes produced significant gains in both receptive and expressive language for enrolled students with disabilities. To quantify expressive language, students with disabilities were asked an open ended question: "What did you do today?" Responses were recorded by Allegro instructors and total words spoken by each student were tallied.

Preschool students at risk with unidentified disabilities



Student word production **increased from an average of 3.40 words to 4.26 words**, indicating significant gains in functional vocabulary and improved social skills. Many preschool children at risk with unidentified disabilities show a deficient of expressive language, but through Allegro's movement education techniques, these children improve their language skills essential for kindergarten readiness.

Case Study: Eli, 4-year-old preschool student at St. John's United Methodist

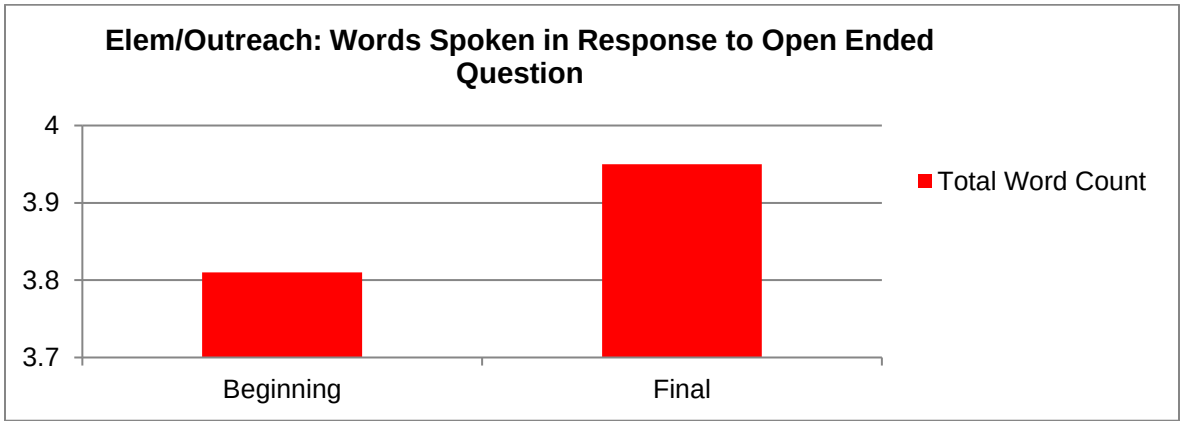
	Beginning	Final
Overall Composite Score	**27**	**49**
▪ Cognitive Development	6	22
▪ Physical Development	17	20
▪ Social Development	4	7

Ms. Karen, Eli's preschool teacher at St. John's United Methodist, explained to Allegro Foundation instructors prior to the start of free weekly movement education classes that Eli may have difficulty participating in the program due to his aggressive behavior and emotional outbursts. As a three-year-old, Eli had bit and punched another student and would scream and flail about when others would get too close to his personal space. As a non-verbal child with autism and possibly undiagnosed oppositional defiant disorder, Eli struggled to engage in his regular preschool curriculum, and all feared a similar fate for his participation in Allegro's free weekly movement education classes.

Believe it or not, Eli is this beaming preschool boy underneath blue sensory fabric!

After his initial assessment, Allegro Foundation instructors developed modified specialized movement education instruction to work hands-on with Eli to provide a structured and safe place for him to learn. By using his body, Eli began to express himself physically in a productive and positive way when he was unable to verbalize his needs due to speech and verbal processing delays. While Eli may never speak fluidly like his same-age typically developing peers, he is learning how to express himself in a socially acceptable way. By January, Eli was demonstrating simple signs to express his frustration, nodding "yes" and shaking his head "no", movements that required pre-planned coordination and social awareness that he hadn't previously exhibited. Pairing body movements with cognitive and social learning helped Eli engage in his strengths and learn in a brand new way through Allegro Foundation's innovative movement education instruction!

Elementary/Outreach students with disabilities



Elementary/Outreach students with disabilities word production **increased from an average of 3.81 words to 3.95 words**, indicating significant gains in functional vocabulary and improved social skills.

Quantifying the true impact of Allegro's movement education classes on the expressive and receptive communication of individual children has life-altering implications – children with disabilities who learn to understand the needs of others and express their own realize significant improvement in adaptive functioning and overall quality of life.

The impact of improved receptive and expressive language throughout an entire classroom can dramatically shape the entire learning environment – children are empowered to communicate more effectively with their teachers, minimize interruptions, and are equipped to work together as a team. Stronger communication skills provides academic teachers a platform to introduce new learning concepts, maintain behavior in their classroom, and encourages students to work together as a cohesive group.

Case Study: Beth, 10-year-old student at Huntersville Elementary School

	Beginning	Final
Overall Composite Score	**31**	**44**
▪ Cognitive Development	12	19
▪ Physical Development	14	16
▪ Social Development	5	9

A strong-willed child diagnosed with autism and learning disabilities, 10-year-old Beth began Allegro's free weekly movement education classes at Huntersville Elementary School by first telling the instructors "no, I don't want to". Not the best introduction, but Allegro's professional movement education instructors are well-trained and skilled at engaging children with emotional and physical challenges to exceed expectations and live to their fullest potential!

While Beth refused to participate with her peers, she was quietly intrigued by the movement education props brought to class, and instructors leaned into this natural curiosity to draw out some verbal interaction. By mid-October, Beth began to make animal noises, including cat and snake sounds during animal action, and wanted to demonstrate how bunnies hop, speaking with instructors and her peers much more than Allegro instructors even knew was possible. Much of what instructors had witnessed from Beth was her non-verbal behavior with a few seemingly canned phrases that included "No", "I don't want to", or "I can't do it."

When Beth told Allegro instructors that she "couldn't do" the associated movement with the sensory fabric during one weekly lesson, Allegro instructors decided to assign her as the designated student to put the fabric away each week after class. Beth really enjoyed this assignment which helped her feel ownership of her own actions and an ability to contribute to the free weekly movement education program. By December, Beth would walk up to the fabric, telling the Allegro instructors "my turn to put the fabric away", and she would drop it off at the designated location! Using phrases to describe her actions, Beth was demonstrating improved verbal skills and overcoming what had previously seemed like an insurmountable challenge to get her to engage in activities. Despite her desire to put away the fabric, Beth continued to refuse to do the movements associated with the fabric taught by Allegro instructors until three weeks before the final class. Once the other students with disabilities had finished the activity and it was time to put the fabric away, Beth was given her own "secret time" to try out the fabric. She went under a small loop and ended up draping the entire fabric piece over herself before putting it away! During the final class, Beth was able to go under the fabric on her own in time with the music cheering "I did it!" and beaming at her own self-confidence and accomplishment. Allegro Foundation is truly changing lives for students with disabilities like Beth in our community!

Elementary/Outreach Students with Disabilities

Expressive and Receptive Language are measured differently on the Low-Functioning/Non-Verbal (LF/NV) assessment form, utilized when instructors observe that a student with disabilities would be unable to complete a significant portion of the standard age-based form.

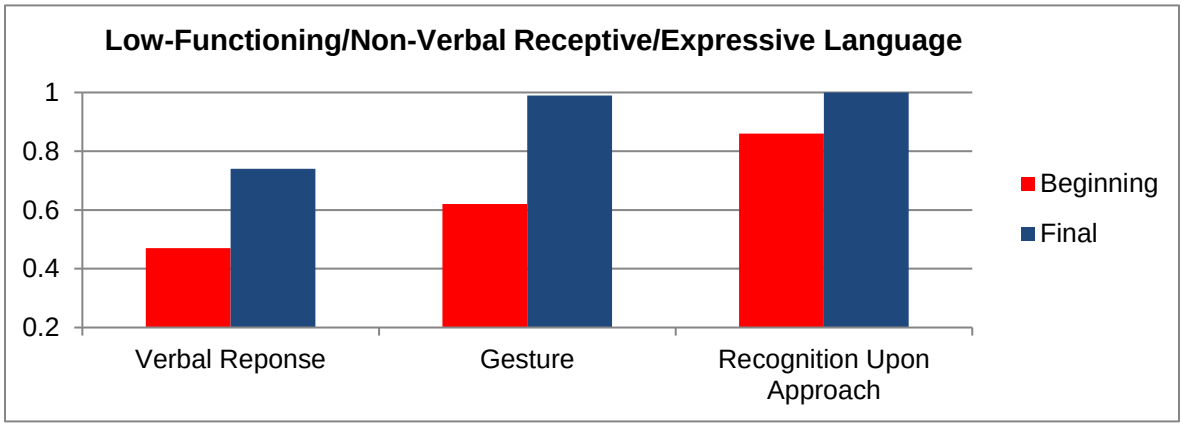
LF/NV PF Scale:

A. Receptive / Expressive Language

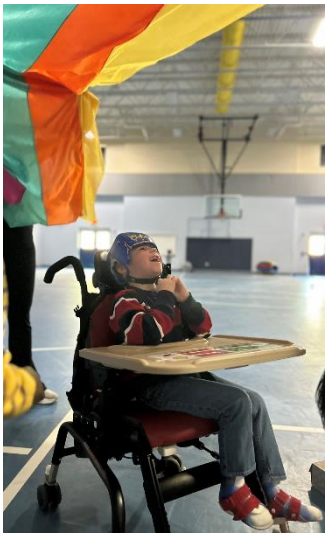
Instructor speaks to student (example: "Hello", "Hi _____".

Does student respond verbally?	_____ Yes	_____ No
Does student gesture?	_____ Yes	_____ No
Does student show recognition of your approach?	_____ Yes	_____ No

Instructors select "yes" or "no" to the above questions at the beginning of Allegro's program in the fall and responses are compared to the results in the final assessment given in May 2023 to measure receptive and expressive language growth.



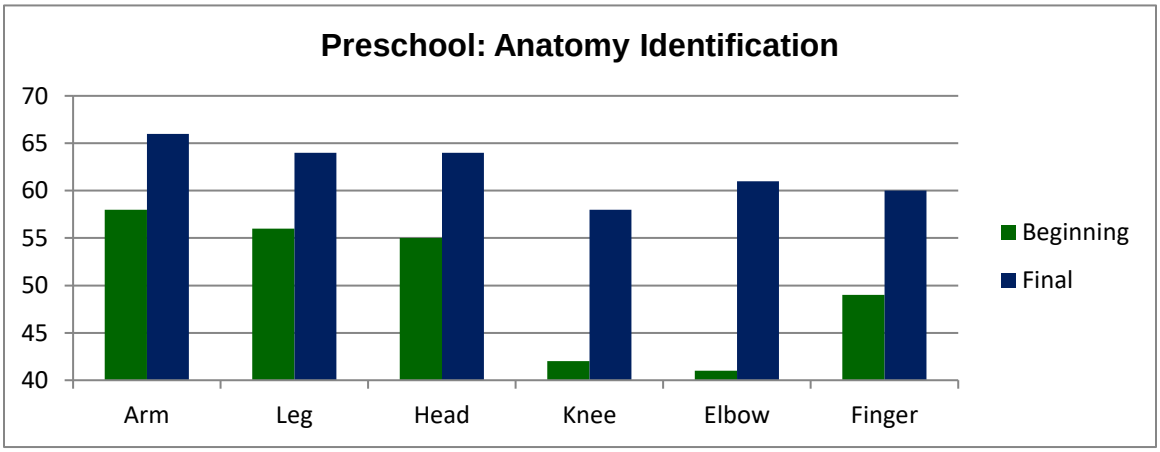
Children with disabilities measured on the LF/NV PF scale exhibited 150% improvement in communicative gesture in response to greeting by Allegro instructor. In human development, gesture production predates all major linguistic milestones and plays a vital role in memory that "paves" the neural pathway for later spoken language.

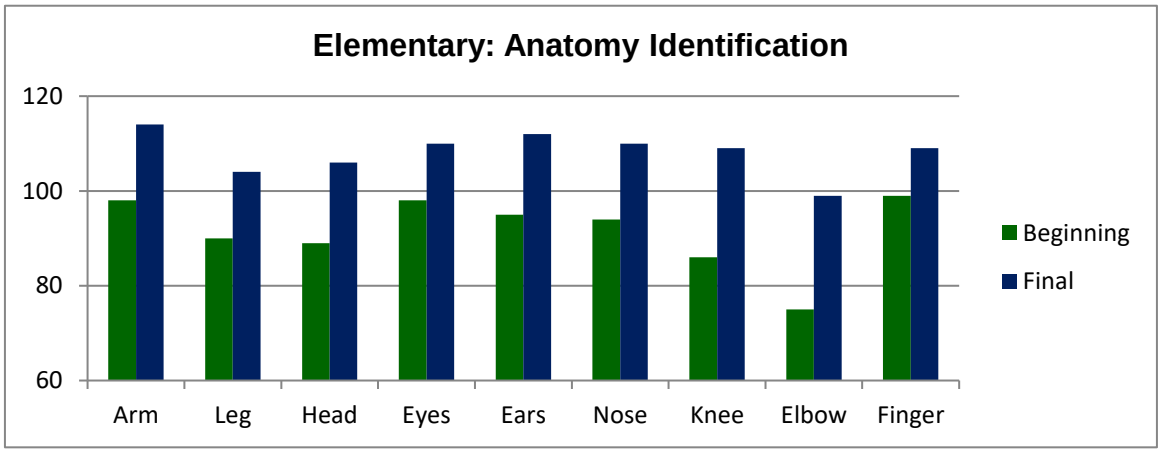


Anatomy Identification

Being able to identify various parts of the human body is an important skill for all children in terms of self-awareness, success in movement education instruction, and as a measure of receptive vocabulary.

Students with disabilities were asked to identify the following body parts on a poster presented by Allegro instructors, and responses have been recorded below. For example, only 148 students could identify their arms in the beginning but during the final administration of the PF Scale, 177 of Allegro's verbal students were successful in identifying their arms! While this could be interpreted as a very minor achievement, important adaptive life skills like understanding body part locations serves as a foundation for even greater academic learning for children with disabilities!

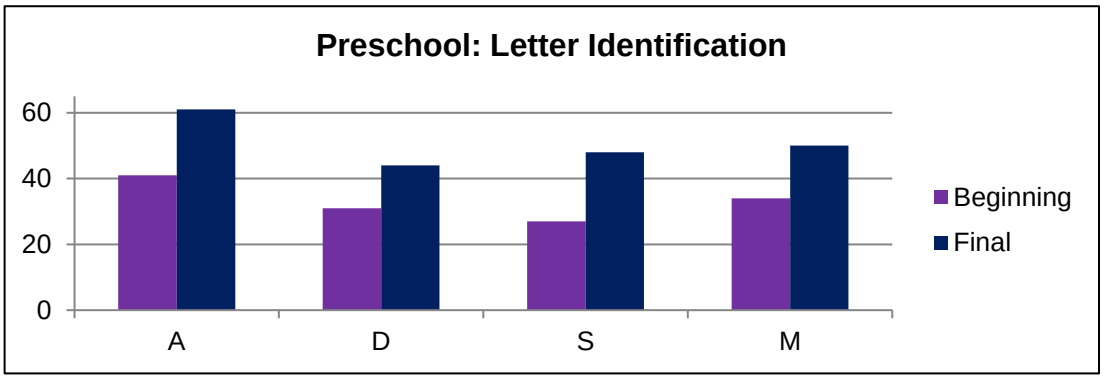


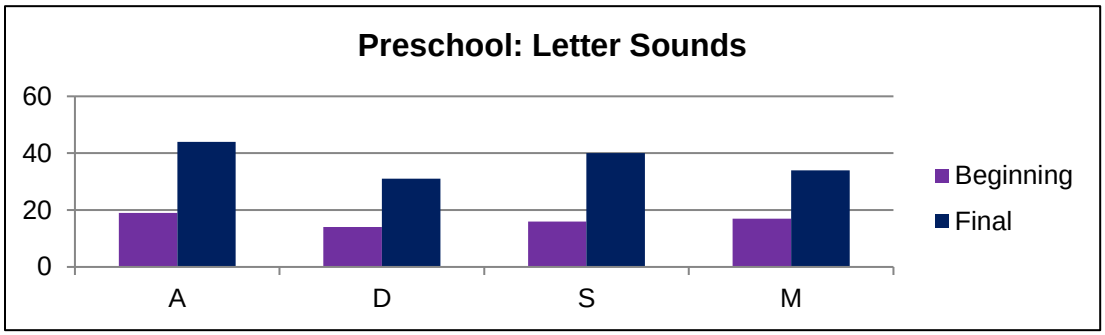


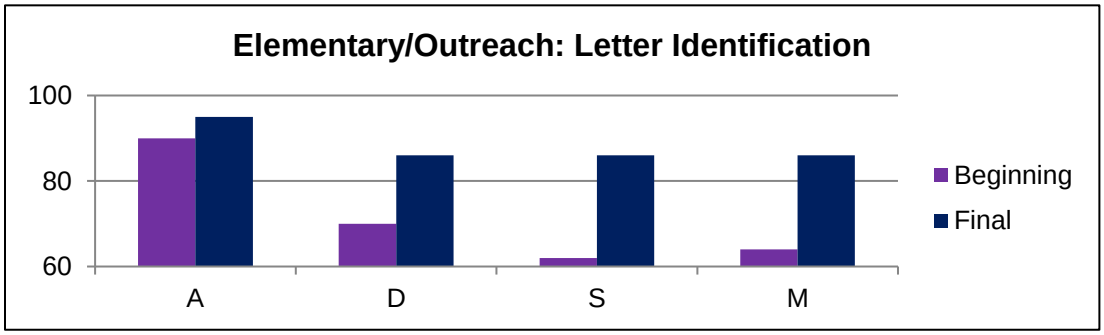
Identifying Letters

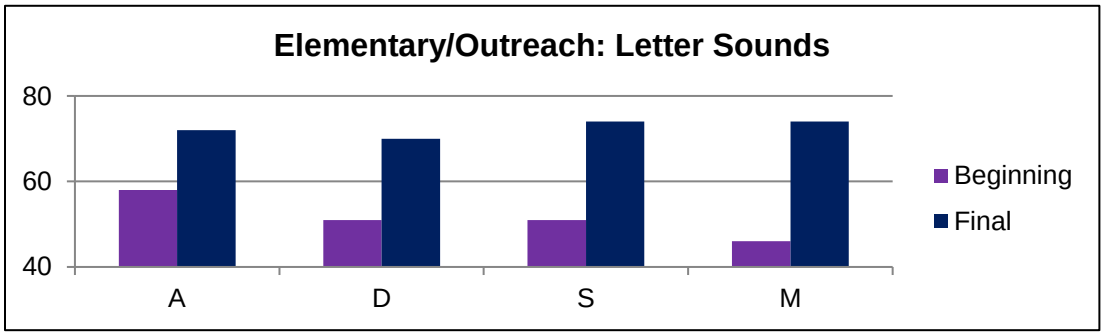
Recognition and identification of letters in the alphabet are vital pre-literacy skills that children with disabilities must master prior to learning to read. Through Allegro's innovative movement education techniques, children with disabilities are taught to use their bodies to form letter shapes, while also learning to manipulate alphabet props as educational tools.

Over the course of 26+ weeks, Allegro's students with disabilities demonstrated remarkable improvements in letter-learning as evidenced below.







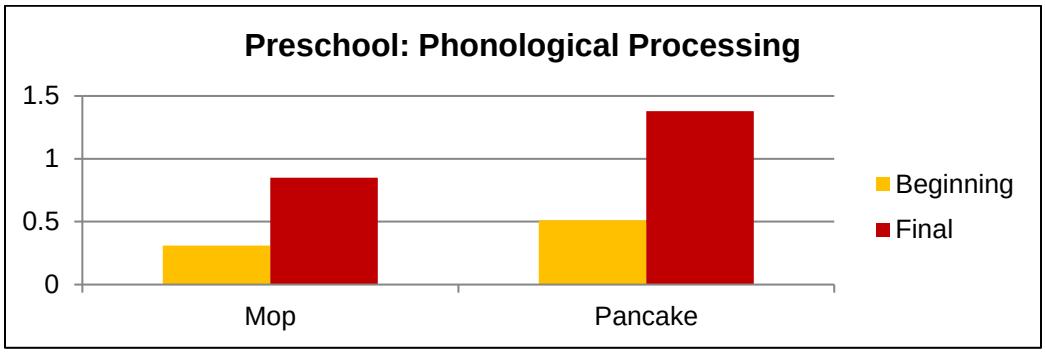


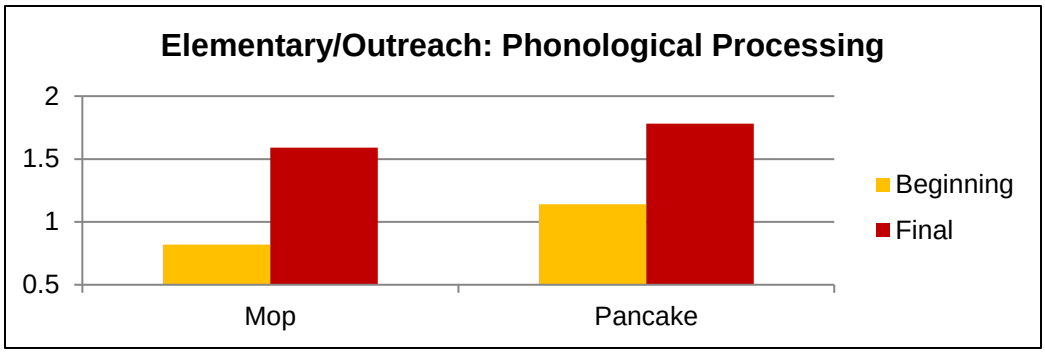
Phonological Processing

Phonological processing is another important measure of both receptive and expressive language, in addition to functioning as a strong indicator for literacy readiness. Children with intellectual disabilities are traditionally taught exclusively through sight-words, but the scientific community is slowly proving the value of phonics instruction for children of all abilities.

To assess phonological awareness, Allegro instructors slowly pronounced two words originally identified by the Wechsler Individual Achievement Test (WIAT-II) for their

utility in this evaluation. The words “mop” and “pancake” were broken down by syllable with 1-second interval spacing, and subsequent student performance was rated between 0-3 with 3 indicating complete mastery.





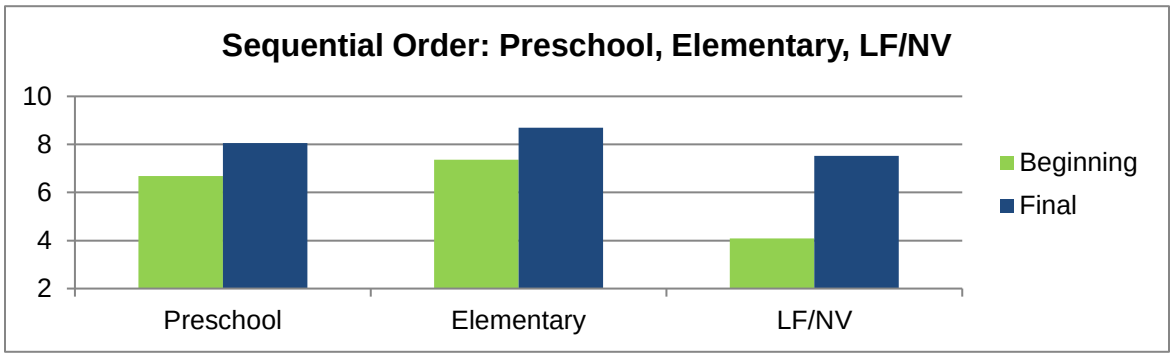
Working Memory / Discrete Test of Sequential Order

Sequencing skills, an important measure of working memory, operate as a strong indicator of future executive functioning skills. Executive functioning, defined as the cognitive construct that controls, maintains, and regulates planning, strategizing, decision-making, and impulse control, is vital to the future independence for children of all abilities, particularly those who may struggle with other academic skills.

Recently published research has demonstrated that impairments in executive functioning during the preschool years correlates with lower mathematics achievement many years later. For this reason, Allegro emphasizes sequencing and other executive functioning skills in all free weekly classes for preschool children at risk with unidentified disabilities. What a remarkable gift that Allegro provides to hundreds of preschool children at risk: Allegro’s early intervention can actually mean the difference between struggling and shining in their future math classes!

The diagnostic criteria of most disabilities indicates some level of deficiency in executive functioning, particularly for those living with moderate to severe intellectual disabilities. As this cognitive construct governs processing, working memory, and other important abilities, it is crucial that Allegro’s movement education instruction targets these skills, something that is often overlooked in the traditional Individualized Education Plan (IEP). Throughout the 2022-2023 school year Allegro’s instruction resulted in substantial gains

in sequencing skills for children with disabilities and at risk as evidenced by numerous case studies and the below empirical data.



Case Study: Edward, 11-year-old student at Crossway Elementary School

	Begin	Final
Overall Composite Score	**34**	**48**
▪ Cognitive Development	7	12
▪ Physical Development	18	21
▪ Social Development	9	15

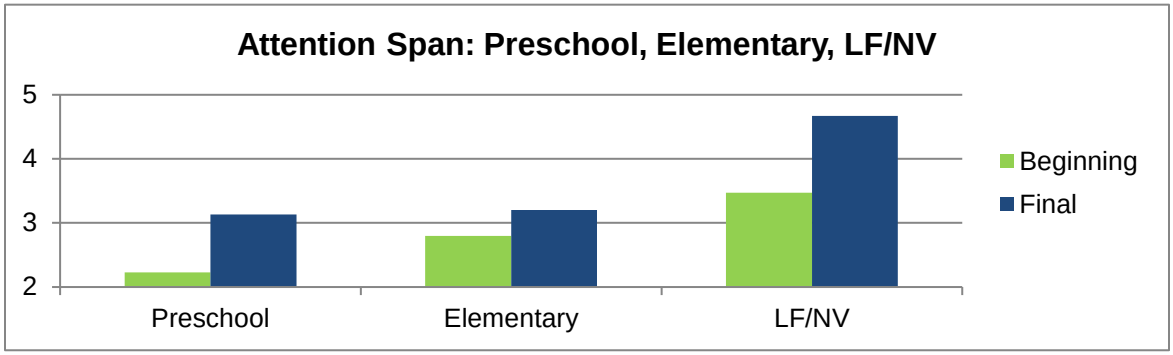
Edward's mother, Denise, remembers her son fondly as an infant and toddler, hitting all of the typically developing milestone and playing with his older sister in the backyard. Just a few weeks after his 3rd birthday, however, Edward's life changed forever when he experienced an ischemic stroke related to the sickle cell disease that he had been previously diagnosed with. Experiencing significant weakness on his right side, Edward entered elementary school in a wheelchair unable to support his weight for any length of time, hold and control a pencil in his right hand, and noticeable processing delays due to damage from the stroke to the frontal lobe of his young developing brain. By the time that Edward enrolled in Allegro's free weekly movement education classes at Crossway Elementary School as a fifth grader, years of physical therapy had strengthened Edward's core and right side to allow him to stand and walk upright for short periods of time, although his right arm and hand still exhibited significant weakness.

Allegro Foundation instructors first identified Edward's processing delay during the initial class and confirmed this diagnosis after consulting with Denise on how to best support her son's learning and unique needs. When given a movement education prompt, Edward took more time than his same-age peers to process those instructions and follow-through with the action, although he was very eager to participate. Growing frustrated when other students with disabilities would begin and master a skill more quickly than he could, Edward would complain to Allegro instructors that a task was "too hard", but persistence and consistency in instruction grew amazing success in Edward's long-term outcome! Breaking down instructions into very small, manageable segments, this motivated 5th grader was able to follow and eventually memorize numerous movement education combinations – clapping his hands in rhythm, shaking maracas while counting to twenty fluidly, forming letter shapes with his body on command while identifying the letter, and so much more! While Edward's processing speed may continue to be slower than same age typically developing peers, his brain is working

hard at making neural connections through new learning technologies taught by Allegro Foundation's free movement education instruction.

Literacy Building Blocks

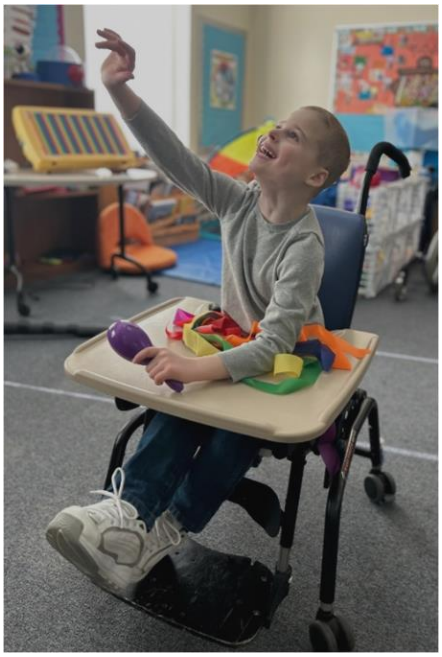
Attention Span: Child's ability to stay on task in comparison to other enrolled students with disabilities



Attention operationally defined as "eyes focused, head in correct direction, no verbal or other communicative interruption".

Attention Span Scoring Procedure:

1 = much less than expected (as compared to others in the class)
2 = minimally less than expected
3 = expected
4 = minimally more than expected
5 = much more than expected



Spatial Relations: Child's ability to navigate independently within the circle without an indicator prop

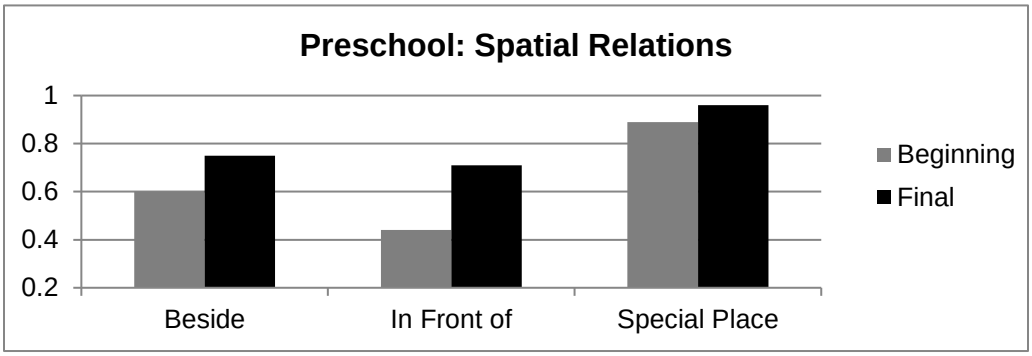
Children with disabilities require the operational understanding of basic spatial terms (e.g. beside, in front of, above) to navigate their classrooms, homes, and interact with others in social situations.

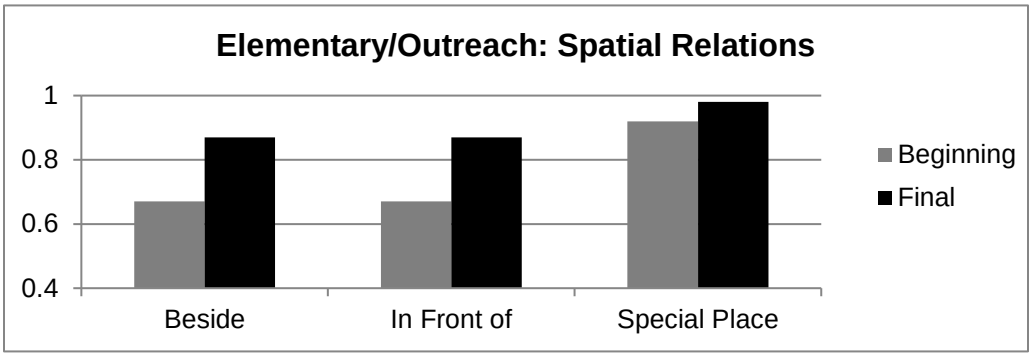
Allegro instructors performed the following requests:

1) Ask child to come stand beside you.
2) Ask child to come stand in front of you.
3) Is child capable of navigating to "special place" in circle?

And then (4) rated perception of the child's understanding of their own boundaries

Responses to these three elements can provide clues into the child's global processing of spatial position, overall willingness and compliance to participate in the program, and receptive vocabulary. Coupled with other measures of spatial processing, including the pencil task and beanbag hold, the assessment can sift through these indicators to determine the true efficacy of our program in developing spatial relations. At the outset of Allegro's classes, most children with disabilities had only a superficial understanding of these terms, as indicated in the below graphs. By completion of the Allegro program in May, however, many enrolled children with disabilities demonstrated strong mastery of these spatial components.





Case Study: Julian, 8-year-old at the Metro School

	Begin	Final
Overall Composite Score	**19**	**28**
▪ Cognitive Development	4	7
▪ Physical Development	6	11
▪ Social Development	9	10

Julian's mother endured significant complications throughout her pregnancy, resulting in his premature birth and many months spent in the NICU battling for his life. Following his birth, doctors determined that Julian had congenital hearing loss, having been born deaf as well has some muscle weakness and orthopedic challenges that make it difficult for him to walk. At eight years old, Julian wears braces on his ankles and does not walk often, preferring to crawl, scoot or sit on the floor. Despite his disabilities, Julian was able to thrive in Allegro's free weekly movement education classes!

Although Julian could not hear the music being played during class, he could physically feel the vibrations and follow along, mimicking the motions of instructors and his same-age peers with disabilities. Allegro instructors used sign language to communicate instructions to Julian frequently, and despite his physical limitations, he learned new skills and abilities, including how to gauge his place in space. Julian was able to move beside of, in front of, and remain in his special place, although he did need the occasional prompting to refocus from Allegro instructors. In addition to some sign language, Julian reads lips, a skill that has unfortunately been obstructed throughout the COVID epidemic by mask-wearing. When Allegro instructors were required to wear masks, Julian would stare at them and frown, until finally, he reached for an instructor's face to tear the mask off. The physical obstruction of a mask was blocking Julian's ability to read lips, a primary form of communication for him, and something that could

be easily overlooked if one was not as intune with the special needs of children with disabilities as Allegro Foundation.

Additionally, over 26 weeks of consistent movement education instruction, Allegro became a vehicle for Julian to express himself and test the boundaries of his perceived physical limitations. By March, Julian's lower body mobility had increased significantly, and he was able to move more independently, responding to prompts to stand beside a special place prop and move in front of another marker through sign language. Because of Allegro Foundation, Julian is obtaining physical goals that would have never seem to be possible just 10 months ago prior to his enrollment in our free weekly movement education classes.

Allegro Foundation was able to identify significant potential for the physical outcome of this young student with disabilities through movement education instruction and bring joy to his life through the sensation of moving his body in time with the vibrations of music!

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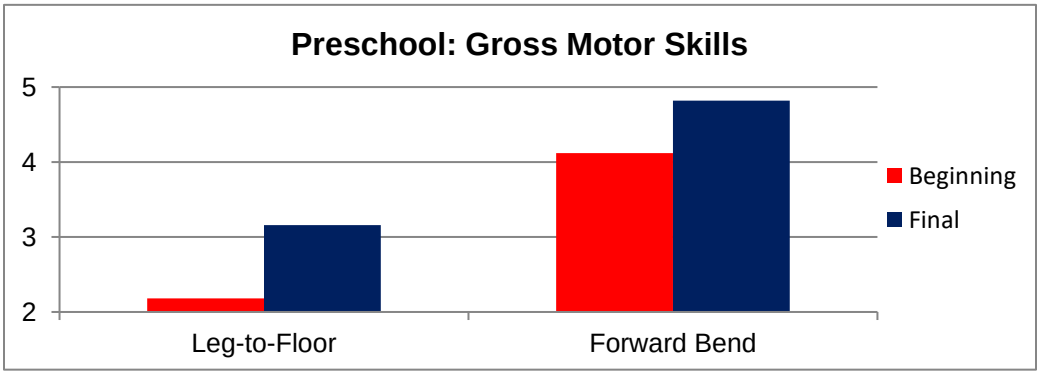
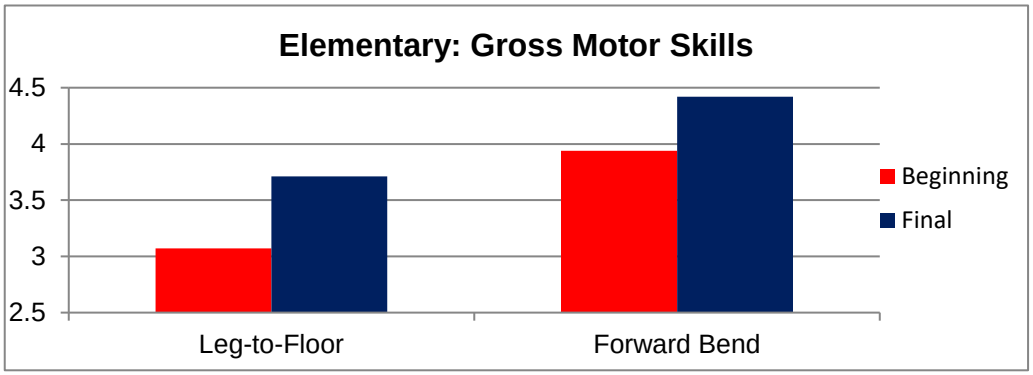
PART II: PHYSICAL DEVELOPMENT

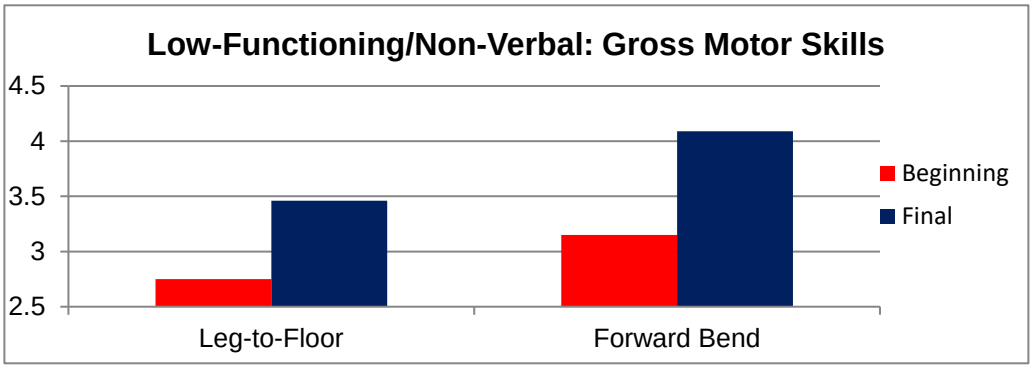
Gross Motor Skills

Measures of gross motor skills indicate growing flexibility and muscle strength gained through Allegro's movement education techniques. Well-developed fine and gross motor skills are necessary when all children learn to write by holding their pencils correctly, read lines of text, and solve math problems.

Improvements in gross motor skills are especially important for children with disabilities living in wheelchairs, as they build the core body strength necessary to assist their caregivers with transfers in and out of their wheelchairs for increased independence.







Case Study, Chase, 6-Year-Old Student at the Metro School

	Begin	Final
Overall Composite Score	**22**	**30**
▪ Cognitive Development	9	11
▪ Physical Development	3	7
▪ Social Development	10	12

Diagnosed with Angelman syndrome just before his first birthday, Chase's disabilities have prevented him from being able to participate in many of the fun physical activities of his same-age peers – running on the playground, playing basketball in his neighborhood and riding a bike on his street. Watching his siblings from the sidelines put an emotional toll on Chase's spirit, but in 2022, Allegro Foundation empowered Chase to fully experience a physical, social, and educational activity which celebrated his unique strengths and worked towards improving his weaknesses!

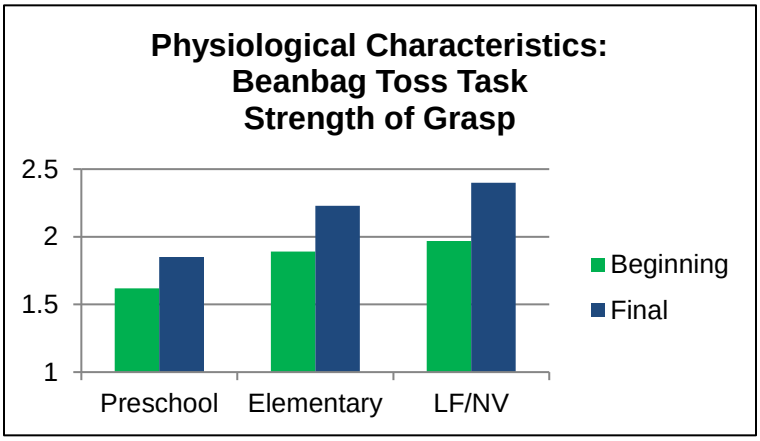
Angelman syndrome is characterized by no or minimal speech, developmental delays and difficulty walking from a genetic abnormality most often diagnosed when speech and crawling milestones are on the horizon. An energetic six year old who enjoys moving and reaching his limbs, Chase has excellent grip but lacks strength in his core and uses a wheelchair to move throughout the school. With self-help/adaptive living skills of a 12-18 month old, Chase needed hands on assistance throughout his enrollment in Allegro's free weekly movement education classes.

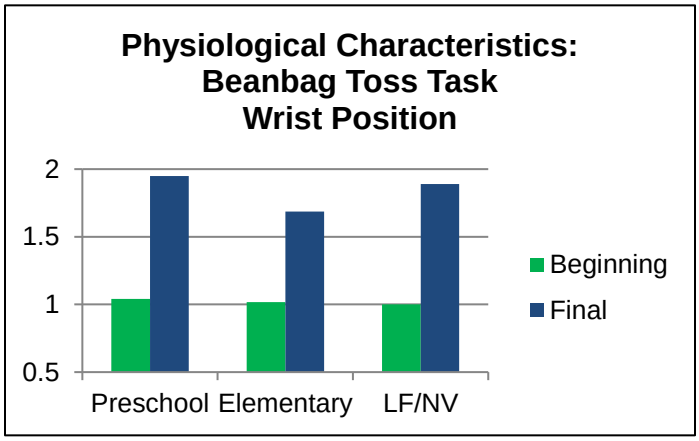
Through weekly repetition of the same movements, engaging both his core muscles and limbs to increase range of motion, Allegro instructors were able to improve Chase's overall joint mobility as well as flexibility in his arms and torso. Increased range of motion and strength makes transfers in and out of his wheelchair easier for both Chase and his caretakers, and brings him closer to greater self-sufficiency. By the end of the 2022-2023 school year, Chase's core was strong enough for him to participate out of his wheelchair on the floor and with direct physical assistance from Allegro instructors!

Fine Motor Skills / Dexterity

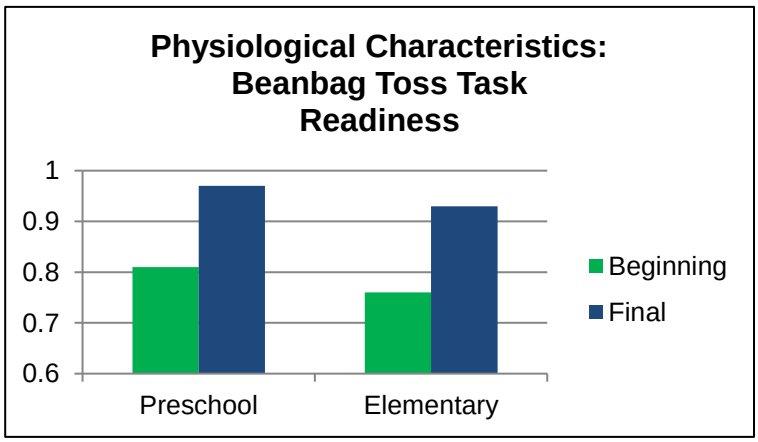
Certain genetic disorders result in dermatological differences (skin structures, connective tissue, elastin, etc.) that may affect how sensation is perceived by children with disabilities. As a result, Allegro's students have more difficulty in grading movement of muscles and experience greater challenges in manipulating an object properly.

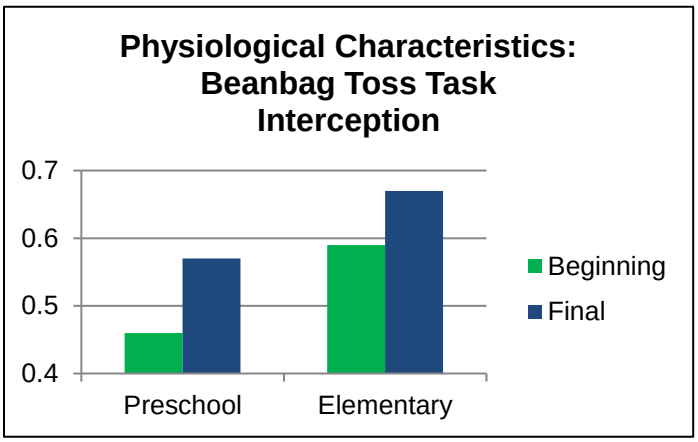
Using the PF Scale, instructors examined how each child is able to maintain muscular contractions around a joint to hold his or her beanbag in a certain position, while also looking at wrist movement. Some children with disabilities do not automatically progress into using an extended wrist position for fine motor activities and must be taught through Allegro's movement education techniques.





Both a cognitive and physical measure, Allegro's PF Scale Beanbag Toss Task requires students to plan their movements (executive functioning), anticipate the velocity and direction of the toss, and compensate for its forward motion by absorbing the beanbag's momentum.

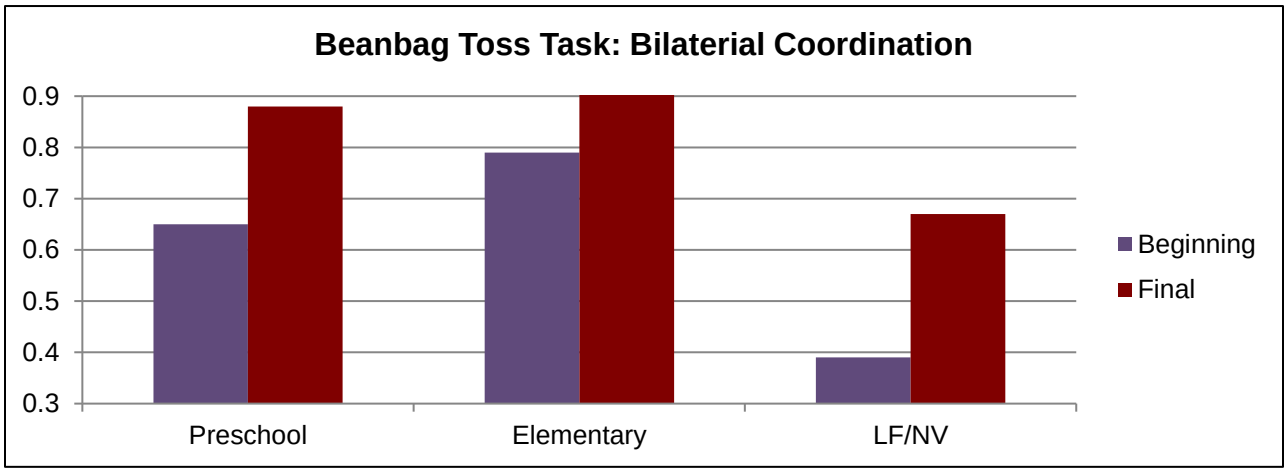




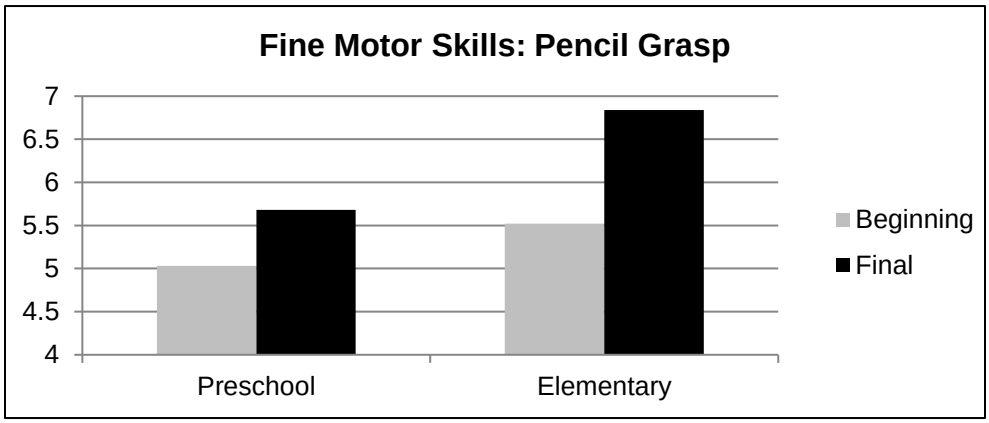
*** The Low-Functioning/Non-Verbal PF Scale does not score readiness and interception*

Bilateral Coordination

Drawing upon findings in biological research, Allegro enhances academic learning by engaging both sides of a child's brain simultaneously, ensuring a more complete learning experience. Warm-up exercises begin all classes where students with disabilities are asked to touch each hand to their opposite knee, crossing over the centers of their bodies. When a child touches his right hand to his left knee, the left side of his brain is activated to move his right hand while the right side of his brain recognizes the placement of his hand on his left knee, forcing integration of both hemispheres of the brain. When both sides of a child's brain are alert and responsive, he or she can learn in a more meaningful way through all five senses.
In this measure, Allegro instructors ask each child with disabilities to transfer the beanbag from their dominant to non-dominant hand and then evaluate their ability to carry out this task effectively.

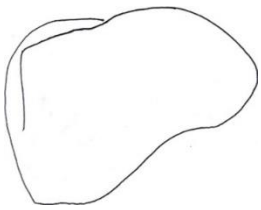


Development of Grasp as Evaluated by Pencil Hold and Control



While grasping their pencils, students with disabilities were asked to copy a circle on blank paper to evaluate their visual-spatial motor integration. Completed circle drawings were rated based on criteria published in the Beery-Buktenica Developmental Test of Visual-Motor Integration, 6th Edition (BEERY VMI). **Composite circle scores ranged from 1-4 with final assessments reporting an average score of 1.72 (preschool) and 2.84 (elementary).**

Example: Score 1 Circle



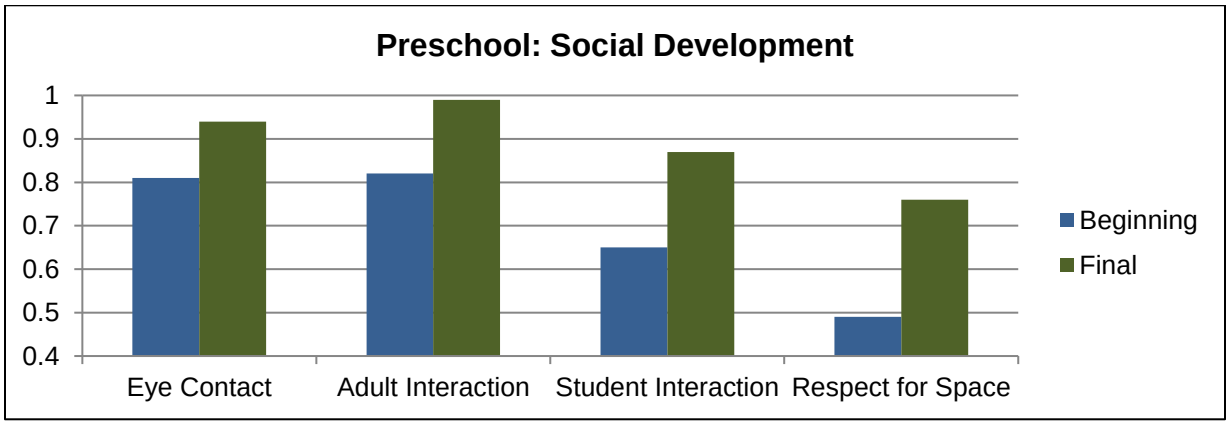
Example: Score 4 Circle

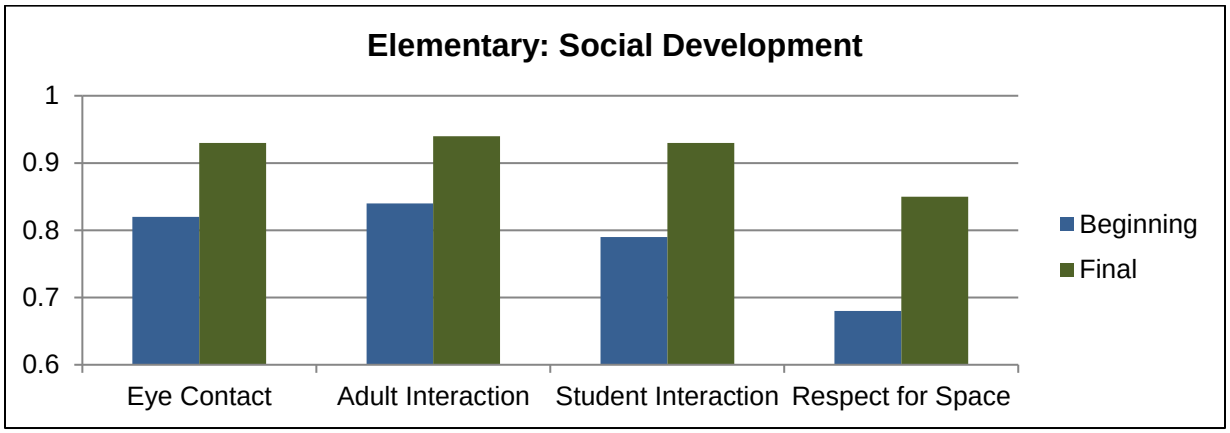
PF Scale: 2023 Final Report

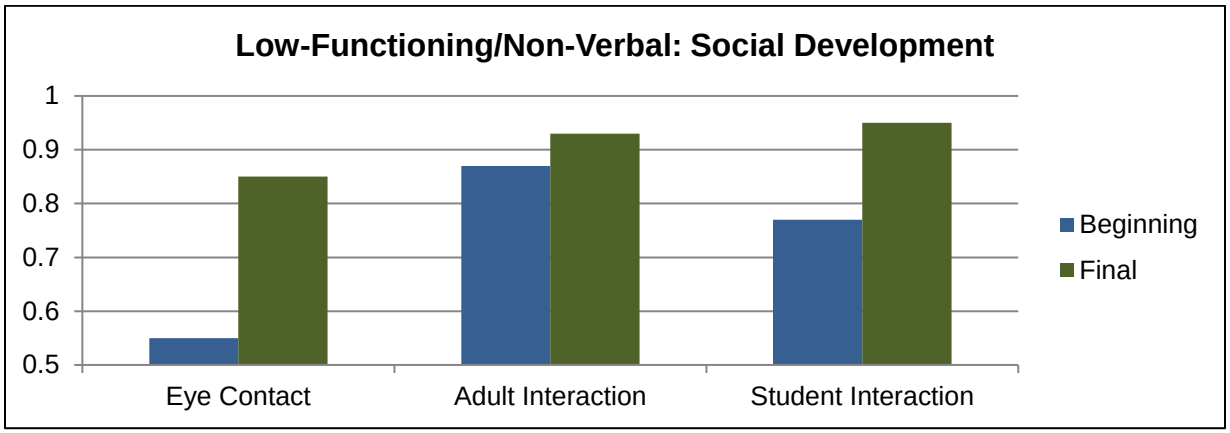
PART III: SOCIAL DEVELOPMENT

Social Skill Development

Social skills, including increased attention span, ability to take turns, following directions, and proper social interaction, taught through Allegro's movement education programs, even at the most basic level, give children with disabilities a head start in school and lower the achievement gap. With improved social skills and stronger understanding of the basic demands to classroom behavior, a child's conduct improves, and thus he or she is better able to learn. Allegro's instructors evaluated social skill attainment through measures of eye contact, positive interactions with adults, peers, and other students with disabilities, as well as a respect for others' personal space.







Case Study, Jabari, 5-Year-Old Student at Torrence Creek Elementary School

	Begin	Final
Overall Composite Score	**25**	**37**
▪ Cognitive Development	9	11
▪ Physical Development	12	17
▪ Social Development	4	9

Jabari sauntered quietly behind a much larger peer when he first entered Allegro Foundation's classroom in August 2022, timid and reluctant to join an otherwise more boisterous group of children with disabilities excited for what promised to be an adventurous learning opportunity through movement education. While Jabari could verbalize a few words, his Torrence Creek Elementary School teacher explained that he had only heard Jabari speak in a one-on-one interactions and was otherwise very withdrawn and reserved in all classroom activities. The youngest of 4 rambunctious boys in his family, Jabari's diagnosis of autism, ADHD, and learning disabilities which made spoken social interactions a daunting challenge for a child that already felt inferior, Jabari was even more uncomfortable to "break out of his shell" in a room full of same age peers with disabilities.

While social and verbal interactions produced anxiety for Jabari, moving his body to the flow of music appeared to produce exactly the opposite effect – when Allegro Foundation's movement education instructors lead his class through a series of

movements, such as using hula hoops for stability and muscle control or passing underneath fabric, Jabari's body came alive.

Allegro's movement education instructors first noticed that Jabari would not get close to his peers during circle time, but instead would stand a few feet outside of the circle, reluctant and fearful of engaging with other children with disabilities. On his worst days, Mr. Smith, his Kindergarten teacher, would explain that Jabari had fallen asleep in class and refused to engage with his peers. Through repeated movement education instruction, pairing the music to body motion and providing Jabari a much-needed outlet to connect with himself, he was also able to connect with others. Jabari gained incredible self-confidence as he began to replicate movements demonstrated by Allegro's instructors and connect those movements to the obtainment of other academic skills such as learning how to count and identify letters. More than the academic gains realized from Jabari's participation in Allegro's free weekly movement education classes, Jabari developed important social skills, smiling and speaking with his peers in class, and no longer hiding in the back of the group. Jabari connected with his classroom teacher through his newly found self-confidence, and came walking into the Allegro classroom weekly with an enthusiastic smile ready to begin! Allegro Foundation is truly transforming the lives and outcome of children with disabilities through the support of generous individuals like you!

Emotion Processing

Face processing and emotion identification have received front-page attention over the past decade as university and NIH-based scientists scramble to recognize early indicators of autism and develop appropriate intervention strategies. Allegro Foundation…*a Champion for Children with Disabilities* does NOT diagnose any disability, but instead refers children with suspected underlying disorders out for diagnosis to medical providers, providing a valuable service for both the medical community and hundreds of families of children with disabilities.

While NOT a diagnostic measure by any means, Allegro Foundation included an emotion identification and facial processing component in the 2022-2023 preschool PF Scale to examine our program's instructional effect on externalizing behaviors.

The ability to discern and interpret emotions within themselves and others may moderate or even ward off acts of aggression in some populations of children with disabilities. When children are taught to recognize an emotion, both in themselves and others, and identify the root cause of that emotion, the pause for understanding is often enough to prevent an impulsive act of aggression against another child. In various publications, including Matheson and Jahoda's "Emotional Understanding in Aggressive and Nonaggressive Individuals with Mild or Moderate Mental Retardation" (2005), researchers are beginning to understanding the important role of emotion recognition.

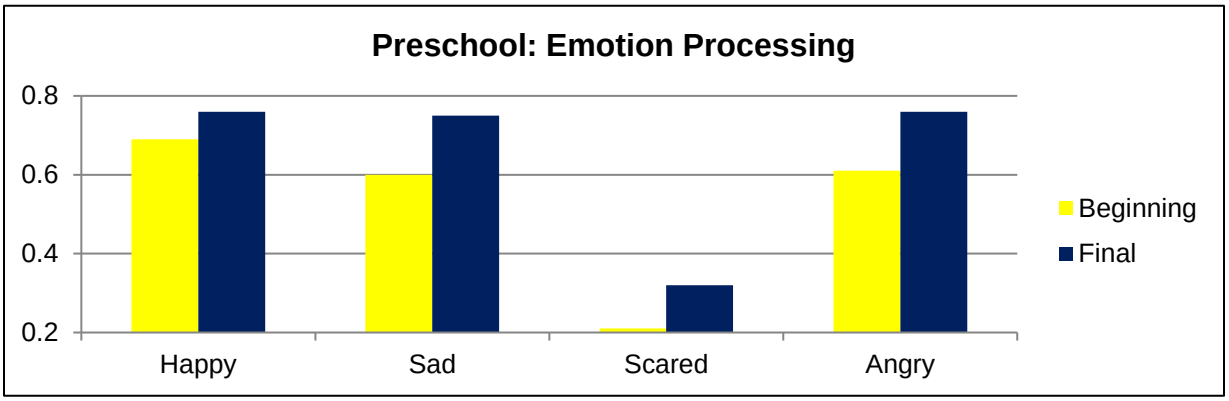
In Allegro's Preschool PF Scale battery, an emotion identification measure was included with the following prompt: "Instructor will point at each face, one at a time, while asking the child to describe how that person feels / what emotions he/she is expressing."

Happy _____ Scared _____
Sad _____ Angry _____

Throughout the 26 weeks of Allegro's free movement education instruction, children with disabilities and at risk participated in learning activities to recognize internal emotional cues and understand basic physiology. For example, students learned that their hearts beat more rapidly after they have just completed a series of movements, but also when they are angry.

Children also discussed situations that would make them happy, sad, scared, and angry to obtain a global understanding of the four basic human emotions in Allegro's classes.

Incorporating emotion processing and identification into Allegro's weekly lesson plans and pairing these important social skills with physical movement proved to be powerful instruments for learning as indicated in the below graph.



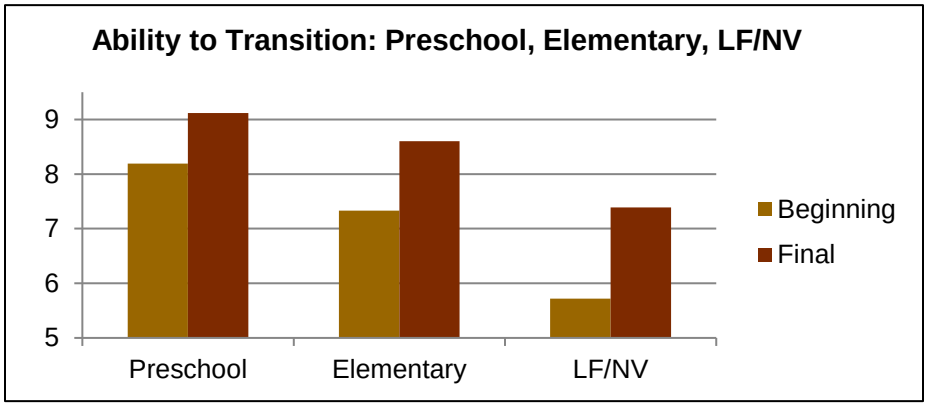
Reactionary aggression was measured by a removal task, where instructors were asked to take away the beanbag (as used in an earlier assessment task) in a "neutral, authoritative manner, not trying to intentionally upset the child." Reactions to removal were coded as either "child ignores"; "child expresses verbal dissatisfaction (with words)"; "child whines/frowns/or uses other non-verbal communication strategies"; "child acts out".

In the first administration of this task, most of Allegro's students with disabilities were angry and frustrated as demonstrated by their acting out behaviors, sometimes trying to snatch the beanbag back from the instructor or another classmate. With frequent lessons about suppressing aggression, proper behavior, and using words rather than actions to express anger, more children with disabilities were using verbal communication strategies to request return of their beanbag, a much more socially acceptable response. For Allegro's preschool children at risk with unidentified disabilities, the ability to express their negative emotions verbally rather than by acting

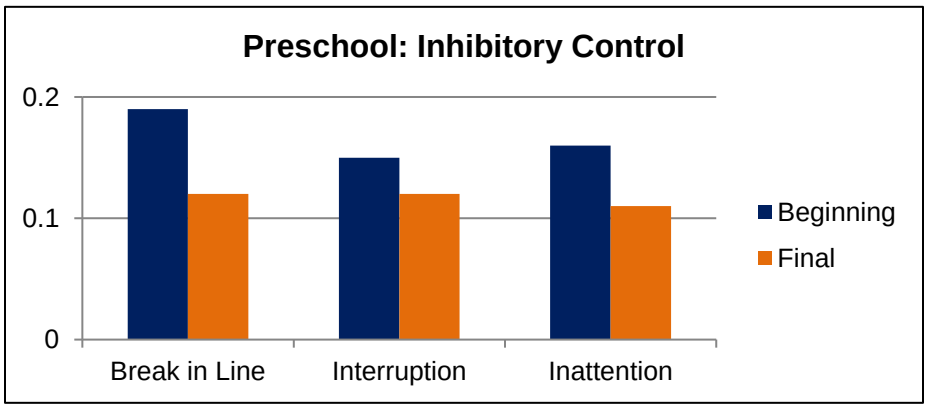
out will be an important skill to carry them throughout their lifetime. Often growing up in dangerous environments where verbal and physical abuse are rampant, Allegro is helping to break the cycle of externalizing behaviors, preventing a future generation of children from relying on violence to express their emotions.

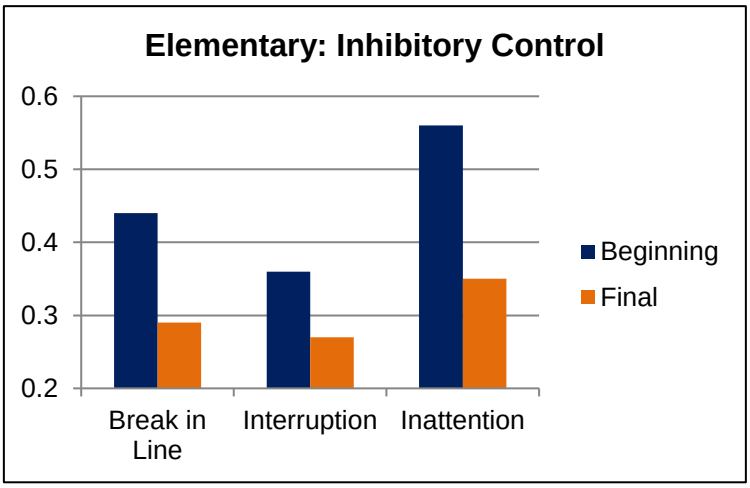
Inhibitory Control

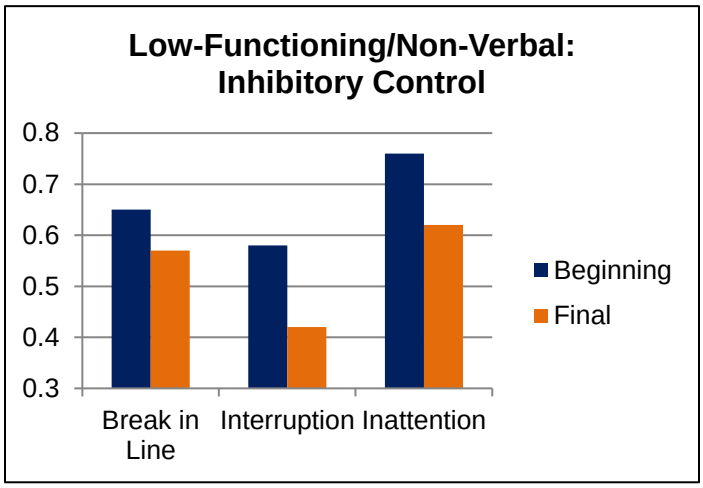
An executive functioning ability and key social skill, inhibitory control can be defined as an individual's ability to thwart an inappropriate, yet desirable action. For example, many children with disabilities may want to break in line to be the first to participate in an activity. In the traditional classroom, opportunities to line up may be infrequent because children of varying abilities do not often participate in the same activities at the same time. On the other hand, many of Allegro's activities require students with disabilities to line up properly and wait their turn before engaging in movement education. Allegro's students with disabilities are also required to raise their hands, avoid blurting out the answers to questions, and not to interrupt in class. These vital social skills were measured and tracked to determine Allegro's efficacy in teaching behavioral strategies and inhibition.



These values are reversed scored. A reduction in the level of these measures is indicative of students' improved performance in the areas of inhibitory control.







Case Study
The Metro School

Allegro class enrollment: 22 children with disabilities
Demographics: 11 African American, 6 Caucasian, and 5 students of Latino origin

Darius, 6-year-old boy with mental retardation and physical disabilities

How does this student manifest her disability?

- Darius is a curious child who prefers to be in his own space.
- He doesn't have a full understanding of his body in space and he needs significant prompting for staying in a specific location.
- He is non-verbal but does self-soothe with different sounds and likes to hold hands and feel pressure.

Allegro Instructor Notes: How has Allegro positively changed Darius' life?

- Allegro provided Darius an opportunity to be challenged and grow by ways of learning routine and body control.
- By being exposed to the routine and movements, Darius had to learn to conform to the routine that his class was following. Allegro helped Darius learn to follow a schedule, practice self-control, and dealing with emotions that come with having a group activity that isn't as desired as an individually selected one.
- Allegro helped Darius create positive habits and participate in an activity that stimulates his focus, his physicality and provided an opportunity weekly to push him out of his comfort zone.

Allegro Instructor Notes: Describe Darius' success at the end of the school year:

- At the beginning of the year, Darius used a foam chair on the floor to help him stay in one spot, but it would usually result in him pushing it up against a wall to tip it, or Darius rocking or using the chair in other ways that may be unsafe or unproductive.
- As the year went on, Darius was more willing to participate in Allegro and with fewer hands-on prompts, which is a great success since all of the class is led by tactile prompting and fewer opportunities to mirror or mimic.
- Allegro instructors identified growth in Darius' ability to tune in and focus on new and immediate tasks. He looked and observed the fabric as it went over him and stayed still while he watched the fabric go over his peers.
- Darius transitioned to using a wooden chair with a seatbelt to help him stay in one place instead of the blue foam chair. This new chair which required much more core stabilization and control both physically and mentally and was physical evidence of Darius' immense growth and development through Allegro Foundation throughout the year.

Case Study
Crossway Elementary School

Allegro class enrollment: 23 children with disabilities
Demographics: 14 African American, 2 Caucasian, and 7 students with disabilities of Latino origin

Jaxon, 4th grade student at Crossway Elementary School

Diagnosis: autism spectrum disorder

How does this student manifest his disability?

- Jaxon uses an iPad for communication assistance but will verbalize when prompted and he feels comfortable. He needs frequent prompts to maintain focus, but has improved through a rewards system, and needs fewer prompts now.
- Jaxon enjoys and gains comfort from the feeling of deep pressure and uses beads and rubber chews for his oral fixation. He sometimes self-harms by biting.
- Jaxon needs eye contact and physical touch for him to successfully participate and prompt him to re-focus.
- He uses interlocking rings as a fidget all the time, and they have been used in his reward system.
- Jaxon is able to remain on his spot eighty percent of the time but still will wander and run off and need prompting to come back to the circle. He will often use self-soothing sounds when others are escalated or if there is too much going on around him.

Allegro Instructor Notes: How has Allegro positively changed Jaxon's life?

- Allegro has helped Jaxon gain a better sense of body control in space. It has also provided Jaxon with a structured activity that he can participate in to earn things or experiences he is working towards. He became more aware of his own body's relation to others in space.
- Jaxon used to need prompting and constant positive reinforcement in order to go under the fabric but found excitement and pleasure from the experience at the end of the year. Allegro's instructors noticed a change in Jaxon's behavior when his one-on-one changed as well. The adjustment to working with new people can be difficult, but Jaxon is excelling with his new aide.

Allegro Instructor Notes: Describe Jaxon's success at the end of the school year:

- At the end of the year, Jaxon was able to participate in class on his own accord and with little verbal prompting.
- Jaxon used to need to mirror in order to know exactly what to do, but his muscle memory was able to kick in after he would simply hear the prompt.
- He could stay on his spot for longer durations and would need redirection far less.
- Jaxon still had days when he found it difficult to focus, but he was better able to self-regulate and direct more easily.

Scientific Explanation of Allegro's Movement Education Techniques

The basic philosophy of Allegro Foundation emphasizes the total learning process by combining **cognitive** and **muscle memory** together to stimulate sequential and conceptual learning, problem-solving skills and communication, as well as producing emotional and physiological changes in the body. Simply put, Allegro's students with disabilities develop muscle memory through repetitive motion, strengthening and expanding neural circuits that operate as integral pathways to future academic learning.

So what is muscle memory?

Muscle memory can be most easily defined as a form of procedural memory, where a specific motor task is encoded and consolidated into memory through repetition. Muscle memory actually decreases the need for conscious attention to perform the resulting motor activity, and thereby creates maximum efficiency in learning.

Research suggests that humans are not the "tabula rasa" once argued by Locke. Instead motor memory appears to be genetically pre-wired in all humans. When an Allegro Foundation student with a disability first learns a motor task, movement is slow and easily disrupted without concentrated, focused attention. Through practice in weekly classes, the student's execution of motor tasks naturally becomes smoother, reflecting improvements in his or her brain's synaptic connectivity as a function of repetitive neural firing.

Why does muscle memory facilitate cognitive development and academic learning?

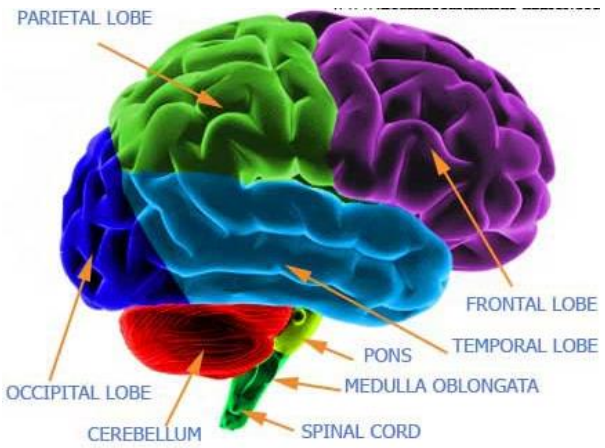
Because motor processing occurs in nearly all parts of the brain, the resulting muscle memory produces complex, neural networks for more efficient processing of a broad range of skills and abilities.

Cerebellum: coordination of voluntary motor movement, balance, equilibrium, and muscle tone.

Frontal Lobe: plan a schedule, imagine the future, use reasoned arguments, process emotion, solve problems. In the rearmost portion of each frontal lobe is a motor area, which controls voluntary movement.

Broca's Area: allows thoughts to be transformed into words. Recent FMRI data determines that Broca's area also plays a crucial role in encoding complex human movements.

Parietal Lobe: Controls movement, orientation, recognition, and perception of stimuli, as well as **reading and arithmetic.**



Thalamus: sensory and motor functions. Almost all sensory information enters this structure where neurons send that information to the overlying cortex. Basal ganglia, clusters of nerve cells surrounding the thalamus, are responsible for motor control.

Mesencephalon: vision, hearing, eye movement, and body movement. The anterior part has the cerebral peduncle, which is a huge bundle of axons traveling from the cerebral cortex through the brain stem and these fibers (along with other structures) are important for voluntary motor function.

Pons: motor control and sensory analysis. Some structures within the pons are linked to the cerebellum, and thus are involved in movement and posture.

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