
# Final Assessment/Evaluation Report

2018-2019 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 800+ 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 between September 17 and October 5, 2018, and final assessments were administered approximately 30 weeks into the session during May 2019.

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 2018-2019 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 modest .703 alpha coefficient was reported** with the beanbag toss task (detailed later in this report) demonstrating a strong .765 Cronbach alpha coefficient in the 2010 analyses.

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 2018-2019 dataset was found to be quite high at Kappa = .904 (p <.001), 95% CI (.901, 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.

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 800 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.

Almost one-half of enrolled students with disabilities who completed the PF Scale assessment receive the Elementary/Outreach PF Scale (n = 175), 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 | .723 | .855 | 174 | .005 |
| Letter Sounds | .603 | .730 | 174 | .005 |

| Fine Motor/Dexterity | Average Pre-Score | Average Post-Score | Df | Sig. (2-tailed) |
|---|---|---|---|---|
| Circle Score | 2.084 | 2.783 | 174 | .005 |
| Pencil Grasp | 5.085 | 6.948 | 174 | .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

Ninety-eight 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 | .711 | .895 | 97 | .005 |
| Letter Recognition | .423 | .559 | 97 | .005 |
| Letter Sounds | .229 | .354 | 97 | .005 |
| Emotion Recognition | .548 | .711 | 97 | .005 |

| Physical Scale Item | Average Pre-Score | Average Post-Score | Df | Sig. (2-tailed) |
|---|---|---|---|---|
| Spatial Relations/Navigation | .518 | .614 | 97 | .005 |
| Range of Motion | 2.903 | 3.814 | 97 | .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

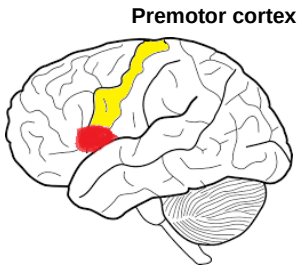
administered the separate low-function/non-verbal instrument with emphasis on receptive language, fine and gross motor skills, and consistent interaction with instructors and peers. Increased attention span, in addition to recognition of social cues, heightens the ability for students with disabilities to learn in a classroom setting, following movement education instruction. 66 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 | 2.769 | 3.016 | 65 | .005 |
| Range of Motion | 1.554 | 2.702 | 65 | .005 |

# **PF Scale:** 2019 Final Report
## PART I: COGNITIVE DEVELOPMENT

### Receptive/Expressive Language Development

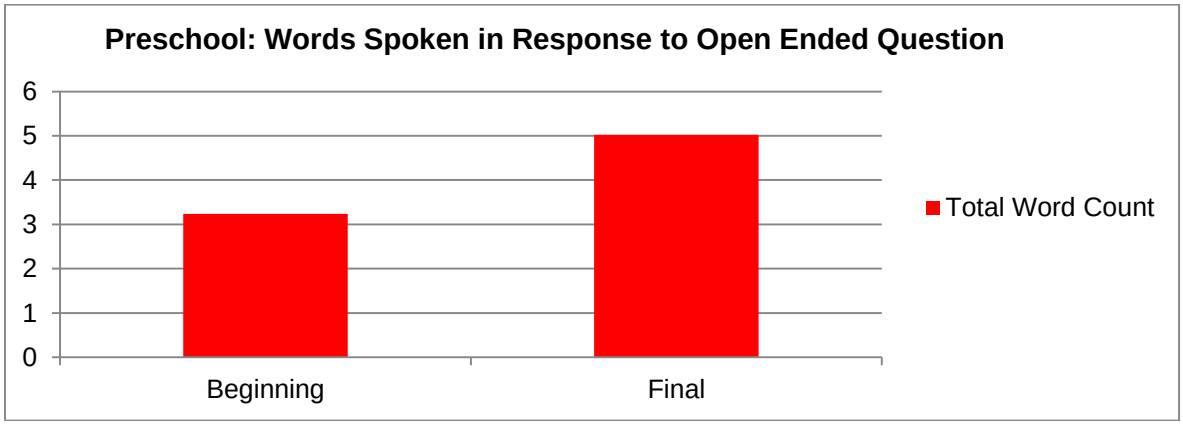
Receptive and expressive language skills are absolutely essential in the day-to-day functioning of ALL children. Without meaningful language (whether it be through gesture, vocalization, or complex sentences), children will struggle to communicate their basic needs in school and experience many obstacles 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 3.24 words to 5.02 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: Alex, Bruns Avenue Elementary Pre-Kindergarten

| | Beginning | Final |
|---|---|---|
| **Overall Composite Score** | **27** | **69** |
| ▪ Cognitive Development | 9 | 31 |
| ▪ Physical Development | 14 | 29 |
| ▪ Social Development | 4 | 9 |

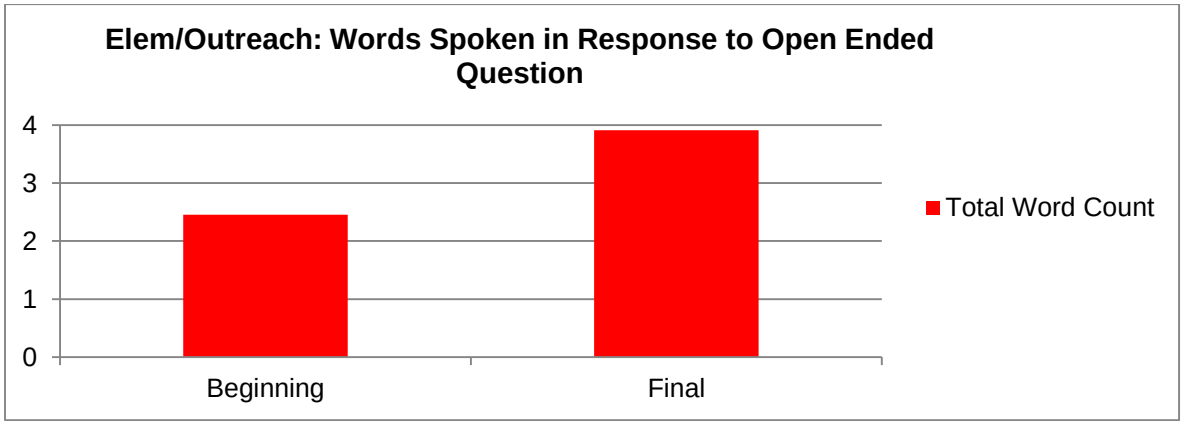
Diagnosed with sensory processing disorder, three-year-old Alex immediately presented as non-verbal, never uttering a single sound and sitting in a single spot or wandering around the room, but not participating in Allegro's free weekly movement education classes. When a new staff member was introduced into the class, Alex acted out by hitting another student who invaded his personal space, a behavior that Allegro instructors had not witnessed before. Alex struggled in his day-to-day social interactions as a result of his sensory processing disorder and anxiety surrounding new people.

Much to everyone's surprise, during the 6th week of classes in November 2018, Alex walked into the Allegro classroom and had a full-length conversation with the Lead Allegro Instructor about his morning and what he had done after school the day before. The attention and commitment provided by Allegro's dedicated staff encourages children like Alex to feel comfortable and safe to realize their full educational potential. Without the persistence of supplemental educational opportunities provided Allegro Foundation, Alex could have missed out on valuable academic learning!

By the end of the year, Alex frequently made meaningful eye contact with Allegro instructors, responding verbally and appropriately to questions and participating in class fully. Unless instructed otherwise, Alex remained on his spot for the entire class and carefully listened for direction, in stark contrast to his previous wandering throughout the classroom.

Allegro Foundation equips children like Alex with skills necessary to thrive in a traditional classroom setting: following directions, remaining in one-spot when instructed, responding to verbal prompts and working together with other same-age children.

**Elementary/Outreach students with disabilities**




Elementary/Outreach students with disabilities word production **increased from an average of 2.45 words to 3.91 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.

**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.

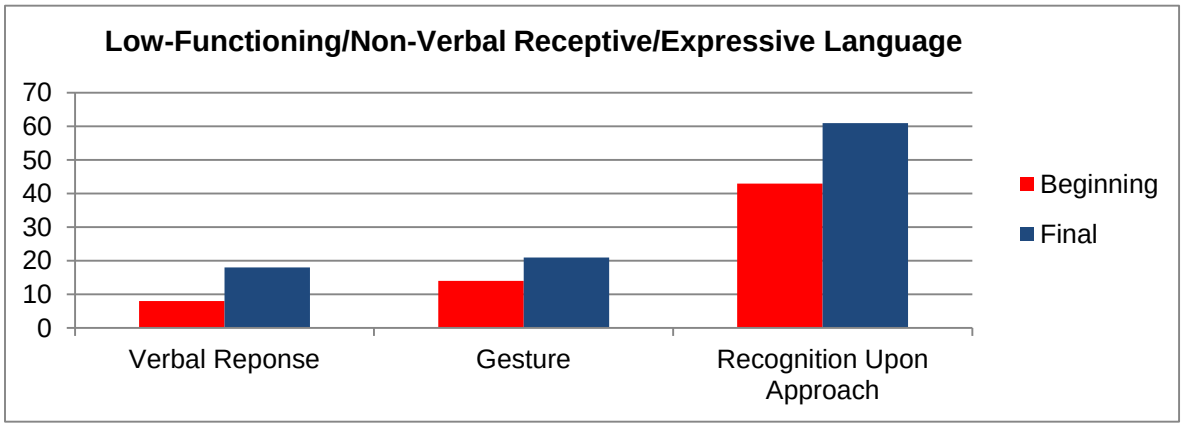
***LF/NV PF Scale:***

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 2019 to measure receptive and expressive language growth.

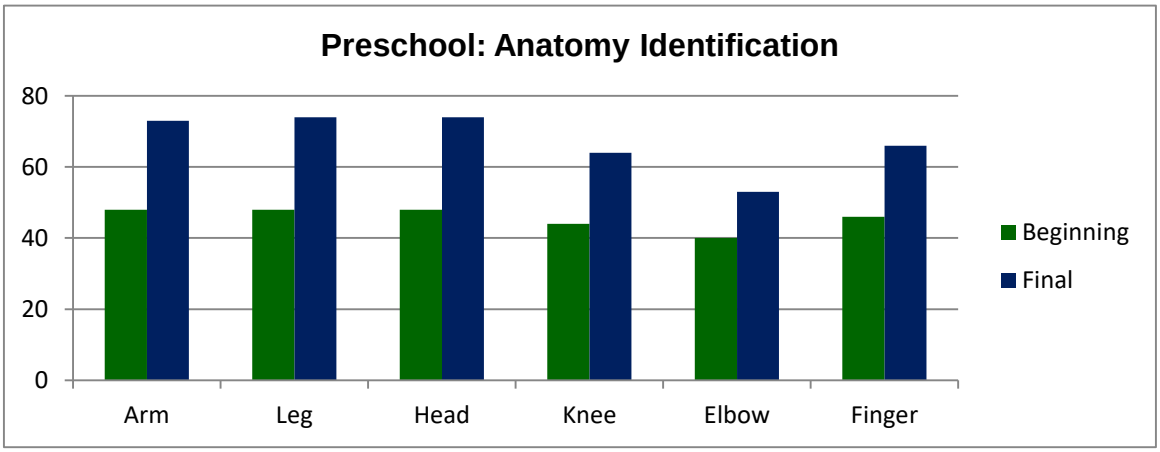


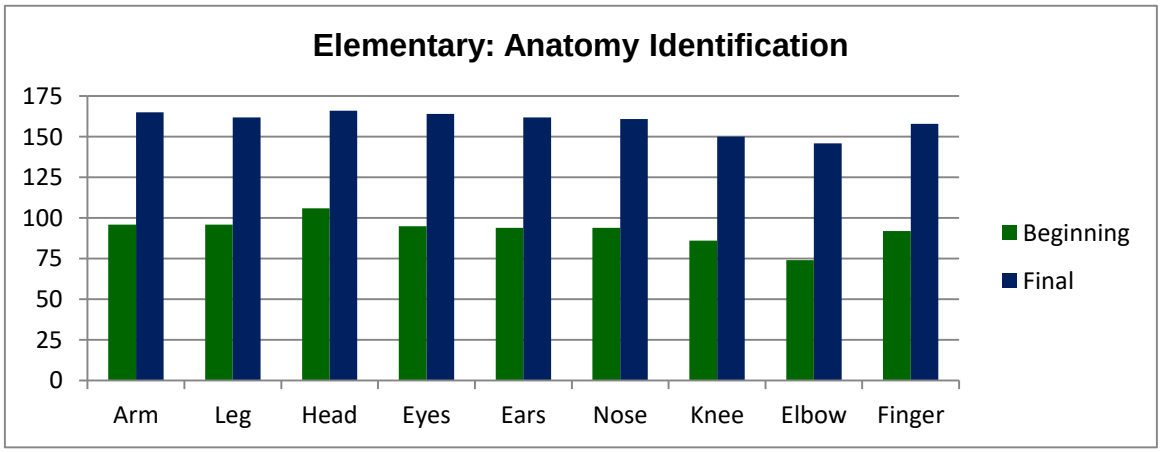

Children with disabilities measured on the LF/NV PF scale exhibited 150% improvement in communicative gesture in response to greeting by Allegro instructor. In human development, gesture production predates all major linguistic milestones and plays a vital role in memory that "paves" the neural pathway 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 169 students could identify their arms in the beginning but during the final administration of the PF Scale, 213 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!

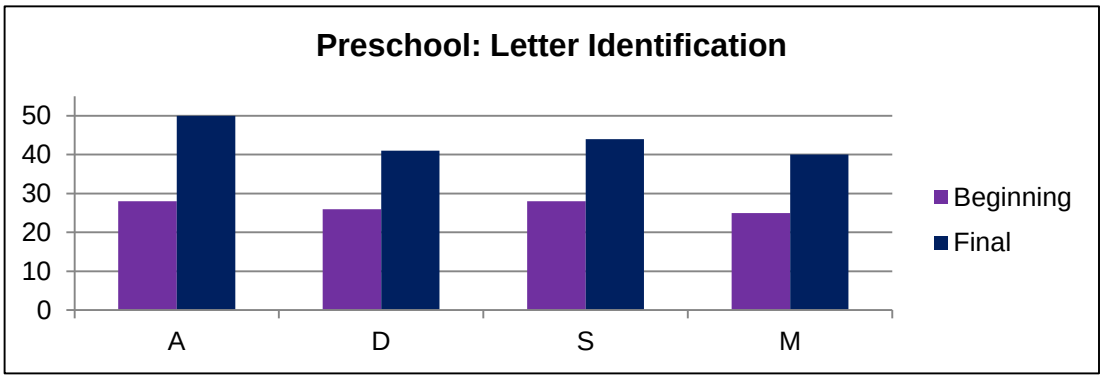


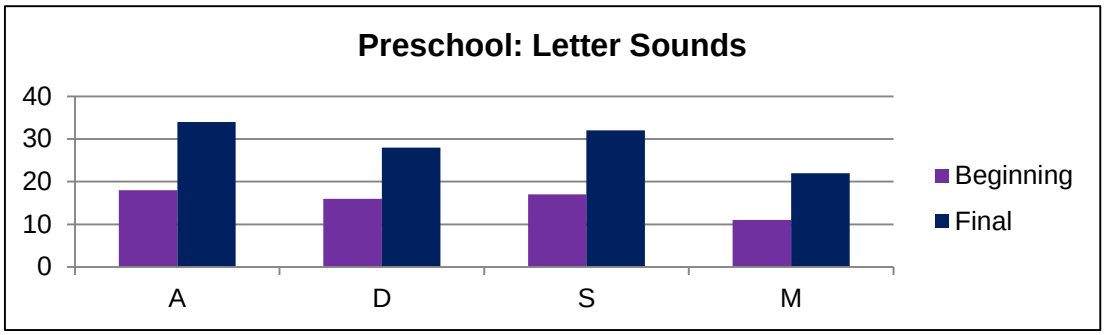



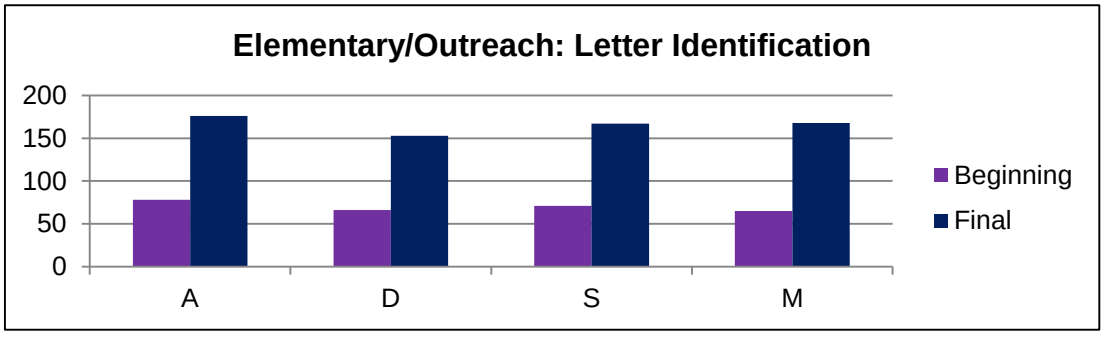

## Identifying Letters

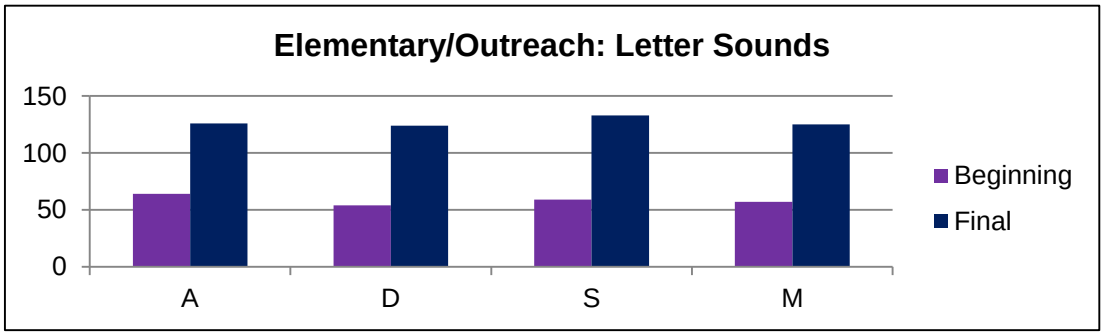
Recognition and identification of letters in the alphabet are vital pre-literacy skills that children with disabilities must master prior to learning to read. Through Allegro's innovative movement education techniques, children with disabilities are taught to use their bodies to form letter shapes, while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



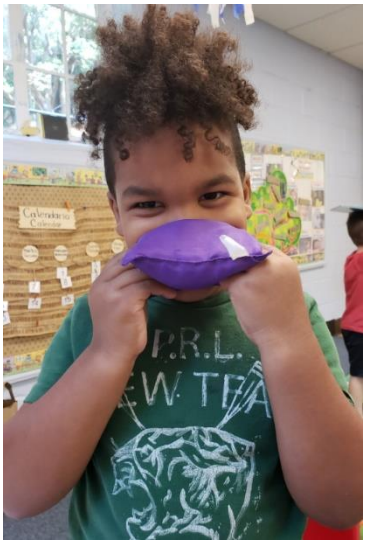




**Case Study: Raye, La Escuelita Weekday School**

| | Beginning | Final |
|---|---|---|
| **Overall Composite Score** | **24** | **66** |
| ▪ Cognitive Development | 8 | 28 |
| ▪ Physical Development | 10 | 16 |
| ▪ Social Development | 6 | 22 |

Raye entered his first Allegro Foundation movement education class with a rambunctious spirit, excited to play with his friends, but when he was tasked with difficult steps, he became frustrated and lashed out. He sat on the floor, kicked and screamed, throwing a tantrum and did not want to participate. His body had struggled to sit through

class, he was distracting in attempting to learn his letters and numbers, had no received supportive learning from his single dad, who was a physically demanding job and was unable to provide Raye the outlet he needed or the cognitive stimulation. Raye needed to be prepared for Elementary School, and through the generation donations provided to Allegro Foundation, our non-profit organization can play this vital role by intervening in the educational outcomes of all children.

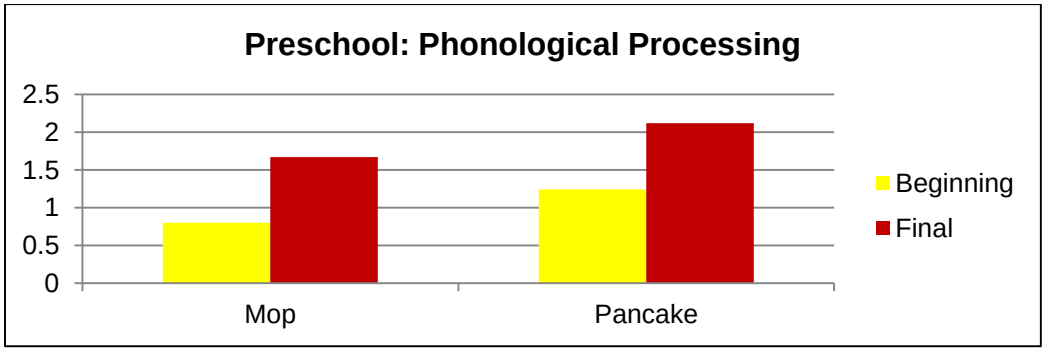


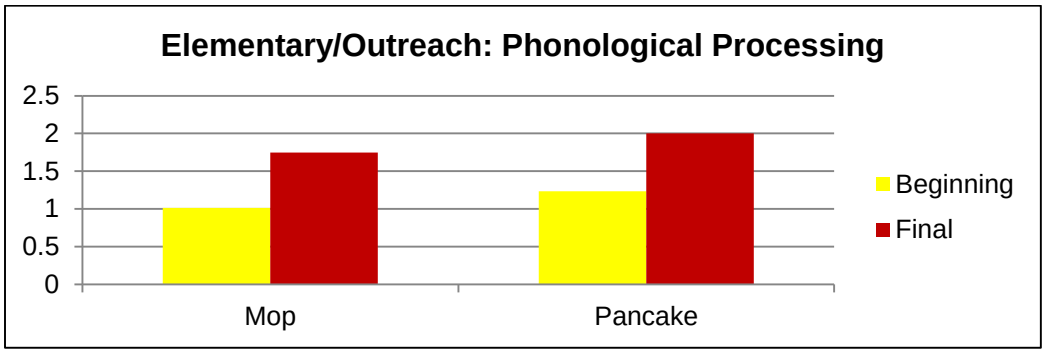
Raye's body craved sensory stimuli, and a learning platform that fed and tapped into his body's physical need for activity. Unique to Allegro's scientifically-validated curriculum, specialized movement instruction paired with educational props (letters, beanbags, numbers, shapes), music, and one-on-one peer tutors empowers children like Raye to learn in a new way. Pairing movement, stretching, and learning to align his body in the shapes of letters and numbers, slowly mastered letter recognition while also improving behavior in his traditional pre-kindergarten classroom at Lake W.
By the final assessment in June 2019, Raye could identify all body parts without prompting and had mastered recognition of all letters and sounds included on the assessment scale ("A", "D", "S", "M")!

**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 2018-2019 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.

**Case Study: Jeremy, Billingsville Elementary School**

| | Begin | Final |
|---|---|---|
| **Overall Composite Score** | **29** | **41** |
| ▪ Cognitive Development | 6 | 9 |
| ▪ Physical Development | 12 | 18 |
| ▪ Social Development | 11 | 14 |

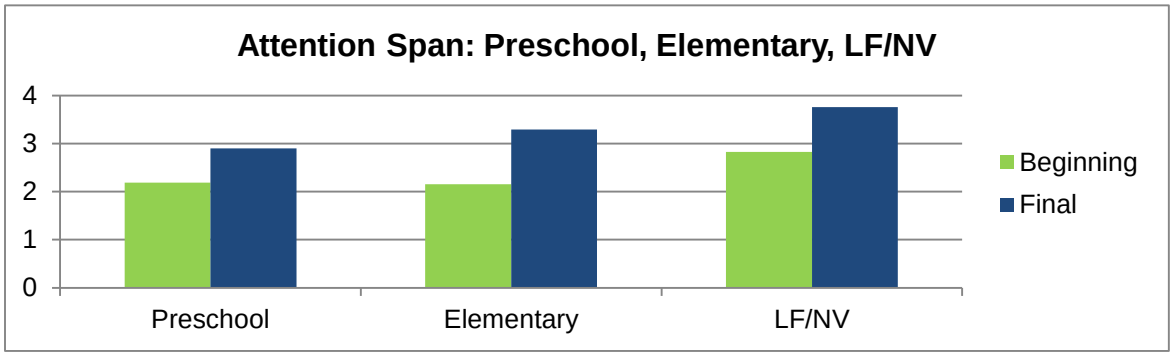
Fourth grader and Allegro Foundations student, Jeremy has made remarkable improvements in working memory and maintaining sequential order through weekly movement education classes. Diagnosed with Down syndrome, Jeremy began Allegro's free weekly classes a reluctant participant and would only engage in class exercises if the learning activity was something that he was already familiar with (Body Talk, Animal Action, Wiggle Worm). He would sit down and take items out of his pockets (e.g. straw

wrappers, toys, buttons, or other things that he had previously collected) to play with and refused to comply with instruction. After working with Jeremy for a few weeks and consulting with his classroom teacher and family, Allegro instructors identified the root cause of Jeremy's reluctance to participate: he was struggling with sequential order and working memory. He could not follow along with the movement instruction provided by Allegro staff and execute the next steps in the sequence from memory. Repeated practice following along with Allegro's instruction and curriculum, engaging muscles and pairing muscle memory and cognitive learning, Jeremy began to make rapid improvements in putting movement sequences together. He was learning to use his body in a new way and remembering how those motions felt through Allegro's unique cognitive learning experience.

Even though he still needed encouragement in June, Jeremy would answer questions asked of him and would remain engaged in the classroom movement education activities throughout the entire duration of class. He no longer pulled out distracting items from his pockets because he felt successful and proud of his accomplishments gained by improving his working memory and sequential learning!

**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".*

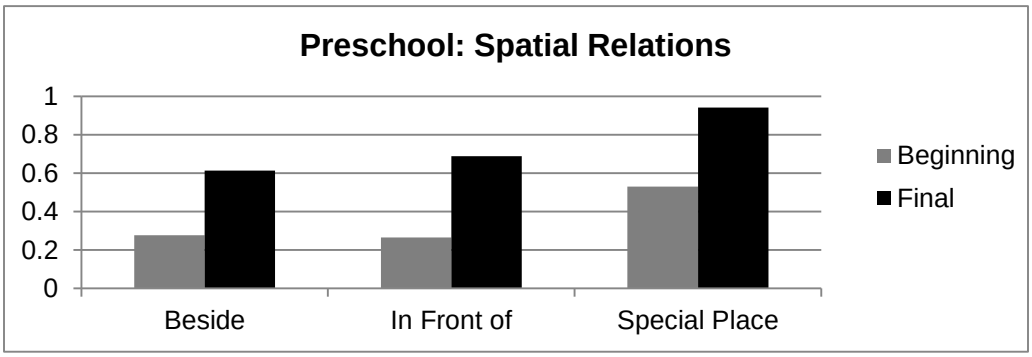
Attention Span Scoring Procedure:
1 = much less than expected (as compared to others in the class)
2 = minimally less than expected
3 = expected
4 = minimally more than expected
5 = much more than expected

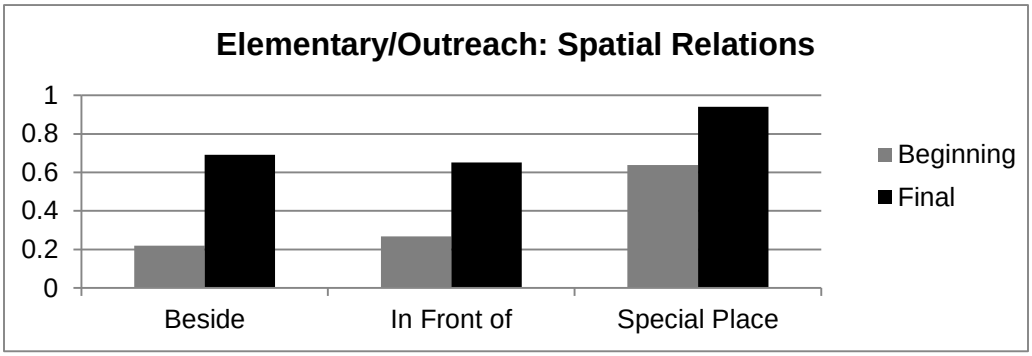
**Spatial Relations:** Child's ability to navigate independently within the circle without an indicator prop
Children with disabilities require the operational understanding of basic spatial terms (e.g. beside, in front of, above) to navigate their classrooms, homes, and interact with others in social 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: Aiden, Metro School**

| | Begin | Final |
|---|---|---|
| **Overall Composite Score** | **16** | **22** |
| ▪ Cognitive Development | 4 | 7 |
| ▪ Physical Development | 5 | 7 |
| ▪ Social Development | 7 | 8 |

At just three days old, Aiden was diagnosed with Ohtahara syndrome, a rare neurological disorder resulting in the underdevelopment of his cerebral hemispheres. Because both hemispheres are significant underformed, Aiden struggles with language, logical processing, and spatial perception. On a weekly basis, Aiden experiences debilitating seizures which have grown more frequent as he ages, and now in the 3rd grade, integration into a classroom with typically developing same-age students is nearly impossible. He has missed many weeks of class due to his medical condition, and educators do not express much hope for Aiden to learn basic adaptive living skills. Through Allegro's movement education program, instructors have been able to teach Aiden some very basic adaptive living skills such as the ability to remain in one location without wandering, to come stand front of a specified location, behind that location, and beside that location. While these learning opportunities may not seem significant to a typically developing same-age child, for Aiden and his caretakers, the ability for him to remain in a location and understand his place in space is a huge step forward in his adaptive living skills and independence!

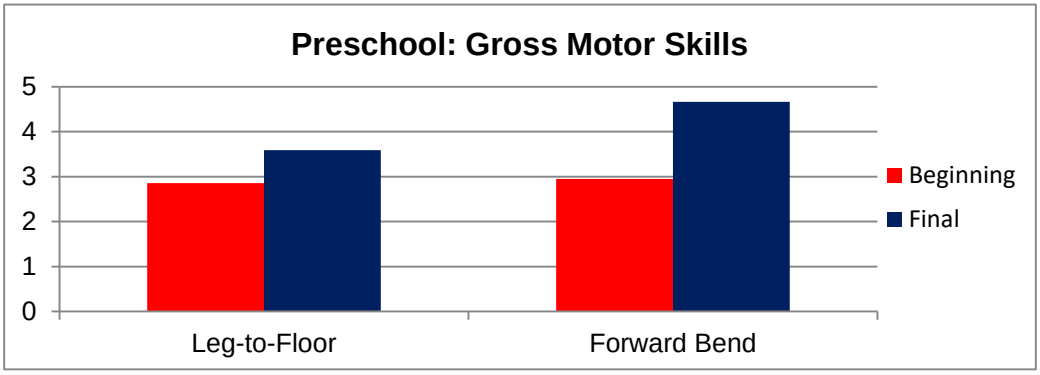
## **PF Scale:** 2019 Final Report

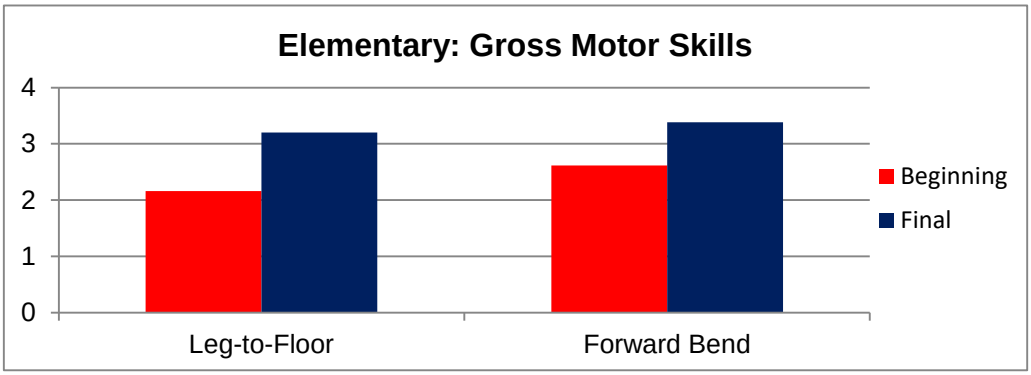
PART II: PHYSICAL DEVELOPMENT

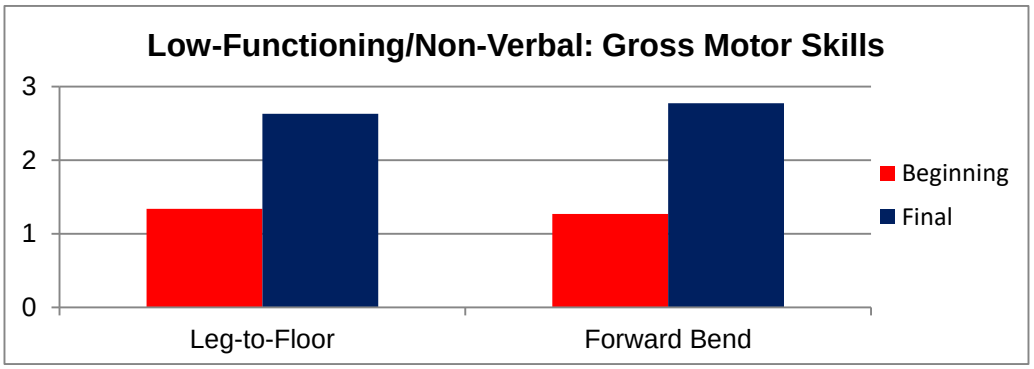
### Gross Motor Skills

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, Genevie, Metro School**

| | Begin | Final |
|---|---|---|
| **Overall Composite Score** | **26** | **49** |
| ▪ Cognitive Development | 8 | 16 |
| ▪ Physical Development | 7 | 19 |
| ▪ Social Development | 11 | 14 |

The 2018-2019 school year was Genevie's second year enrolled in Allegro's weekly movement education classes at the Metro School. Diagnosed with microcephaly (head size significantly smaller than other children of the same age and sex, typically manifesting in developmental delays, difficulty with coordination/balance, and seizures), microphthalmia (abnormally small eyeballs), and cataracts in both eyes, Genevie's participation in activities with her same-age peers had previously been very limited.

In addition to visual and physical challenges, Genevie's behavioral outburst had made it difficult for her thrive in learning environments structured for typically developing children. Genevie frequently turns her head back and forth, side-to-side, seeking out sounds, and when overstimulated, she will act out by screaming and attempting to self-injure. Through a partnership with the nursing program at Carolinas College of Health Sciences, Genevie was paired with a nursing student who assisted her with physical coordination, balance, and strengthening her muscles. During the initial introductions between Genevie and her one-on-one nursing student assistant, Genevie pushed away, screamed, and threw her body on the floor, refusing to participate.

After approximately two months of patient intervention, Genevie and her one-on-one volunteer developed a strong rapport, and her previous behaviors were no longer a distraction to learning through Allegro's movement education curriculum. Genevie's one-on-one assistant was able to reinforce academic learning such as counting and shapes in a multi-sensory way, empowering her to blossom academically and develop some strong basic preliteracy skills.

Allegro Movement Instruction Notes:
"Genevie began using her walker on her own during the school year and would come "running" in each week! Her Metro School teachers told us that they would say it was

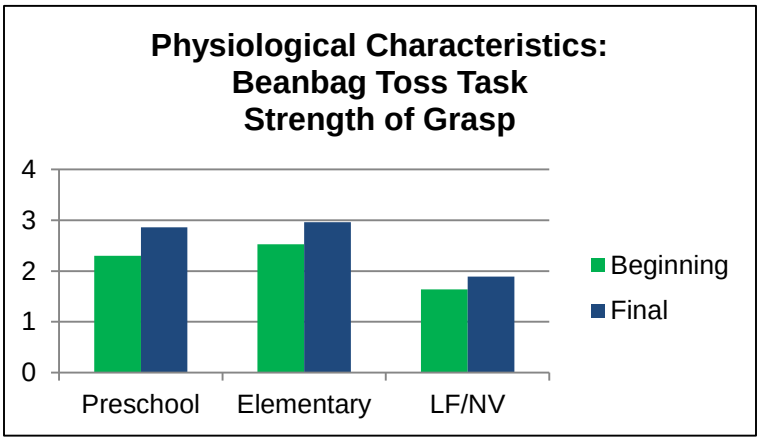
time for Allegro, and she would sing “Allegro, Allegro, Allegro!” and then all but “run us over to get out the door.”

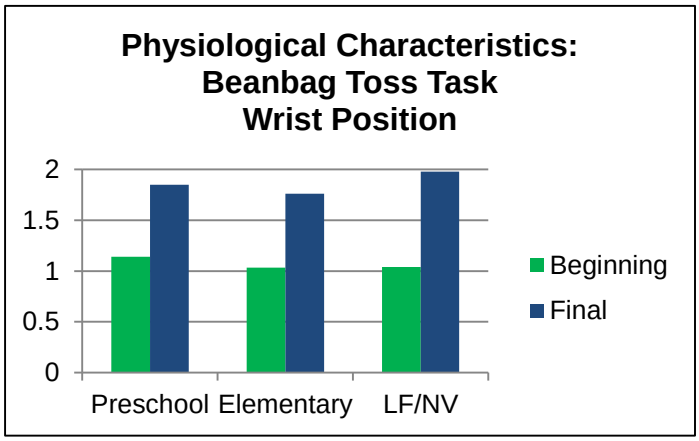
Allegro Foundation is making a huge impact on the behavioral and educational outcome of children like Genevie in our community!

**Fine Motor Skills / Dexterity**

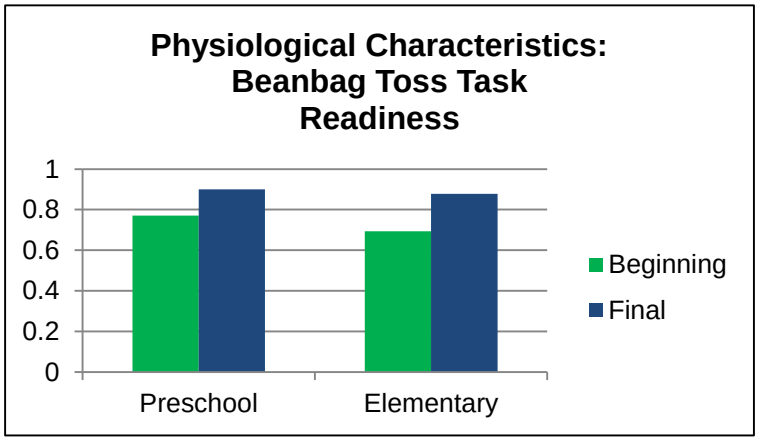
Certain genetic disorders result in dermatological differences (skin structures, connective tissue, elastin, etc.) that may affect how sensation is perceived by children with disabilities. As a result, Allegro’s students have more difficulty in grading movement of muscles and experience greater challenges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

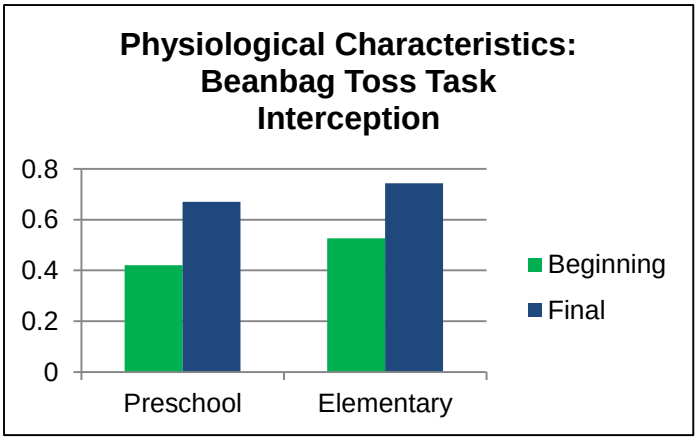
Using the PF Scale, instructors examined how each child is able to maintain muscular contractions around a joint to hold his or her beanbag in a certain position, while also looking at wrist movement. Some children with disabilities do not automatically progress into using an extended wrist position 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*

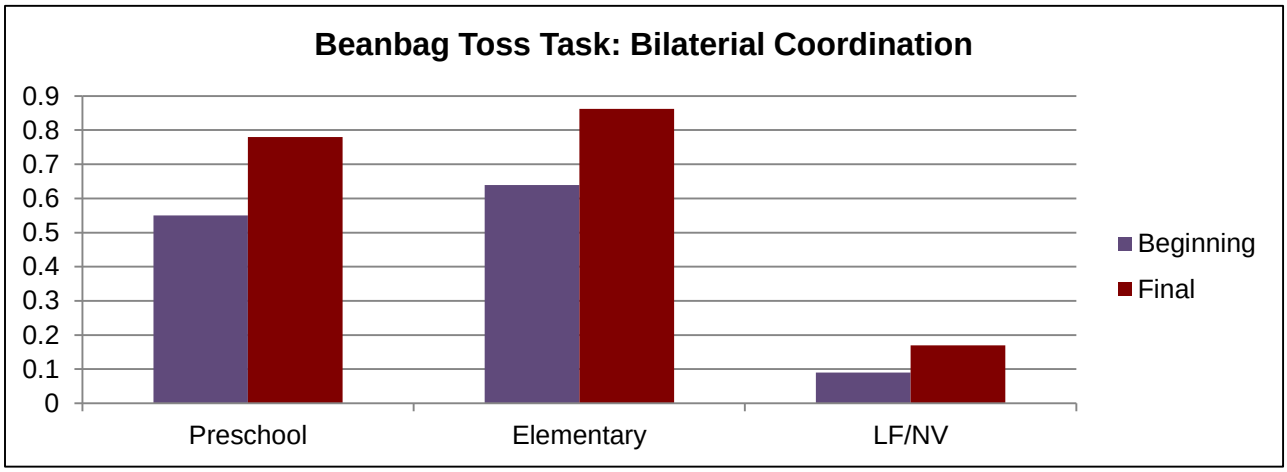
**Case Study, Cole, Gold Hill Elementary School (Ft. Mill, SC)**

| | Begin | Final |
|---|---|---|
| **Overall Composite Score** | **18** | **31** |
| ▪ Cognitive Development | 9 | 10 |
| ▪ Physical Development | 3 | 12 |
| ▪ Social Development | 6 | 9 |

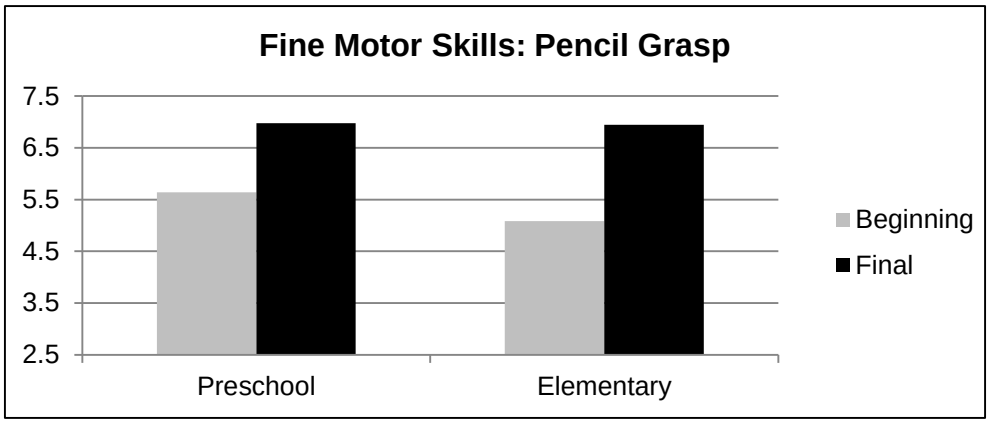
Utilizing an adaptive stroller designed for children with disabilities, Cole relies on his aide, teachers, and volunteers to bring him to Allegro's weekly movement education classes and navigate the school. Diagnosed with multiple cognitive and physical disabilities, the muscles in Cole's right leg are so contradicted, rigid, and atrophied that it can be painful for him to stretch them. Through adapted movement education, Allegro provided physical strengthening and stretching exercises which also improves circulation and stamina for children with disabilities like Cole.

**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.

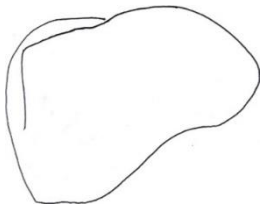


**Development of Grasp as Evaluated by Pencil Hold and Control**

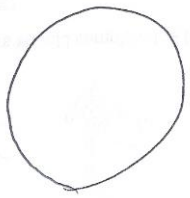



While grasping their pencils, students with disabilities were asked to copy a circle on blank paper to evaluate their visual-spatial motor integration. Completed circle drawings were rated based on criteria published in the Beery-Buktenica Developmental Test of Visual-Motor Integration, 6th Edition (BEERY VMI). **Composite circle scores ranged from 1-4 with final assessments reporting an average score of 1.76 (preschool) and 2.14 (elementary).**

**Example: Score 1 Circle**



**Example: Score 4 Circle**

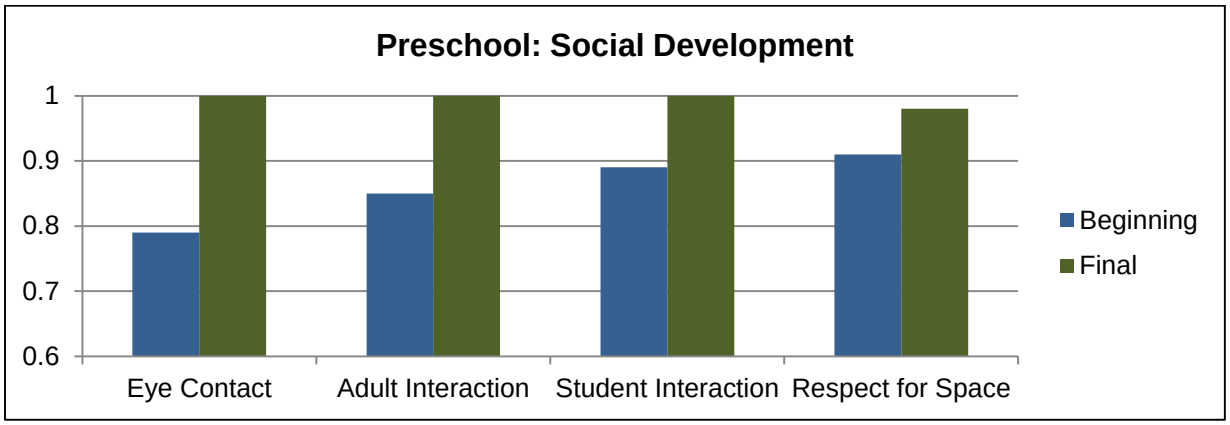


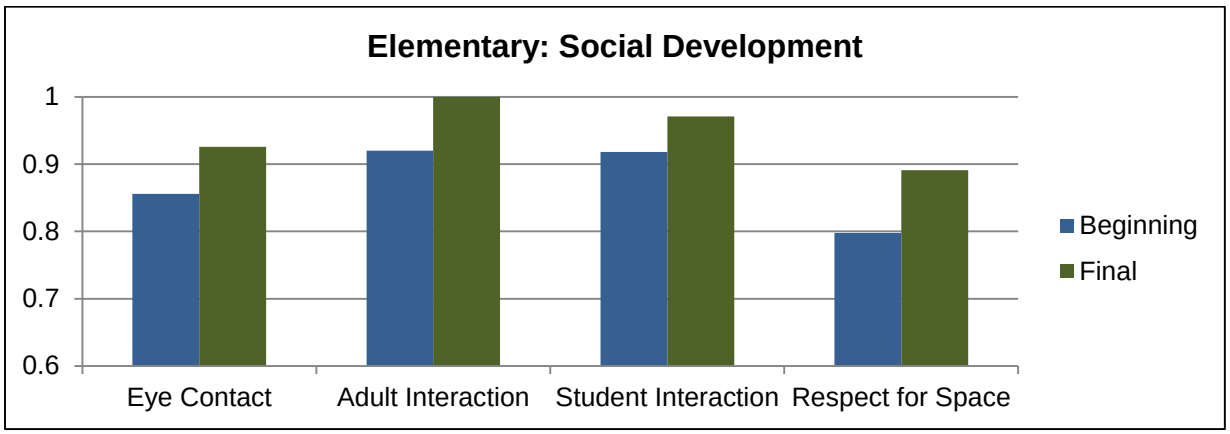
## **PF Scale:** 2019 Final Report

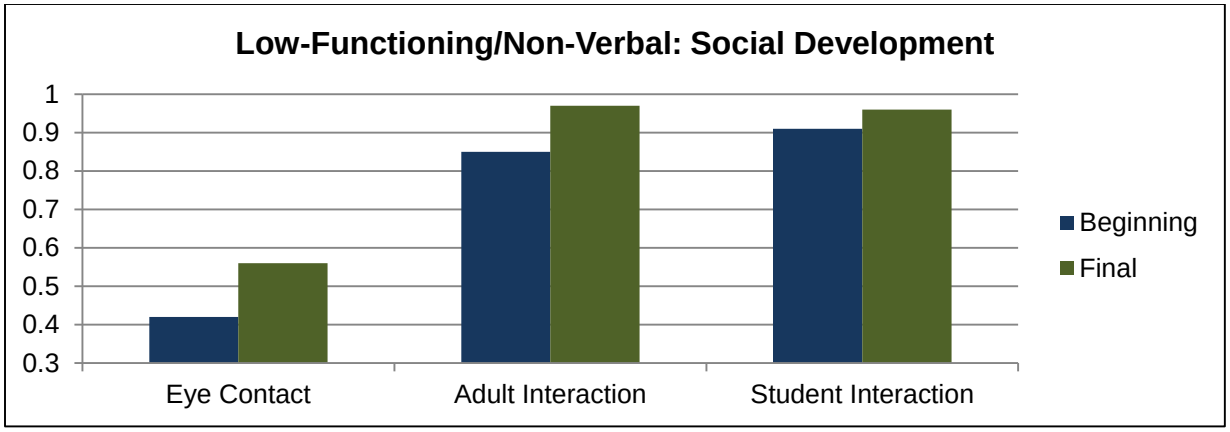
PART III: SOCIAL DEVELOPMENT

**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.




**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 2018-2019 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.

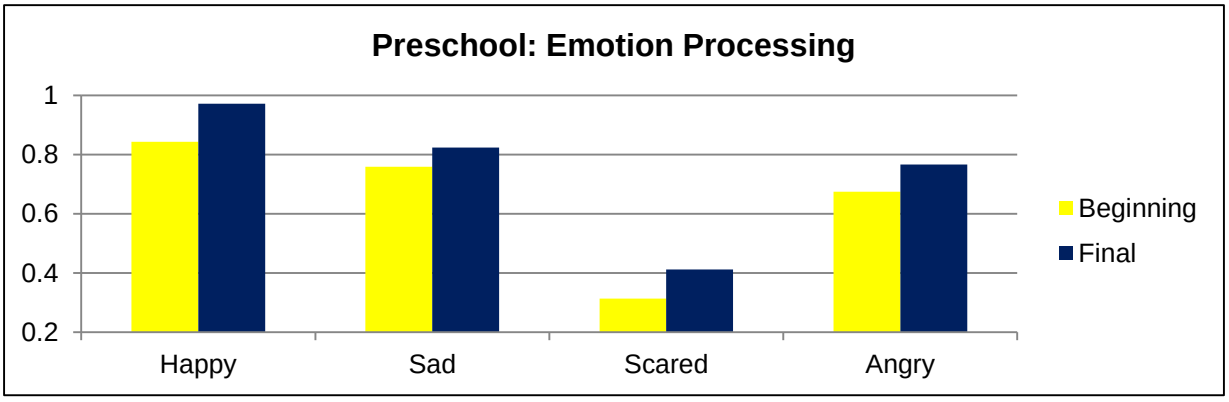
In Allegro's Preschool PF Scale battery, an emotion identification measure was included with the following prompt: "Instructor will point at each face, one at a time, while asking the child to describe how that person feels / what emotions he/she is expressing."

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

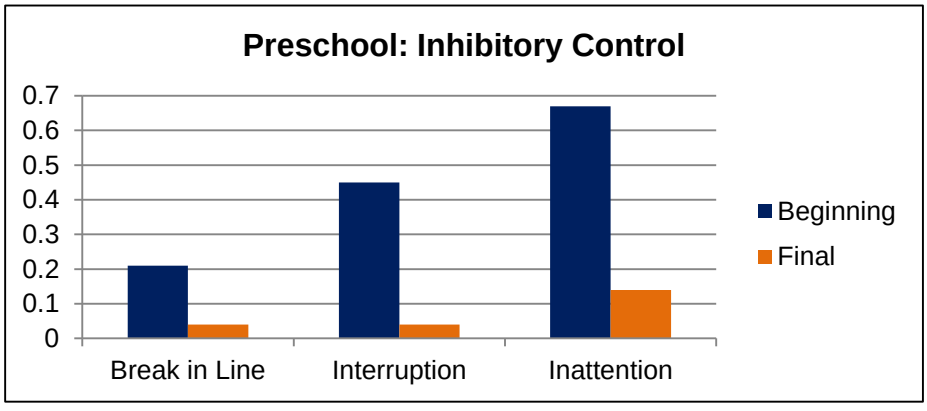
were coded as either “child ignores”; “child expresses verbal dissatisfaction (with words)”; “child whines/frowns/or uses other non-verbal communication strategies”; “child acts out”.

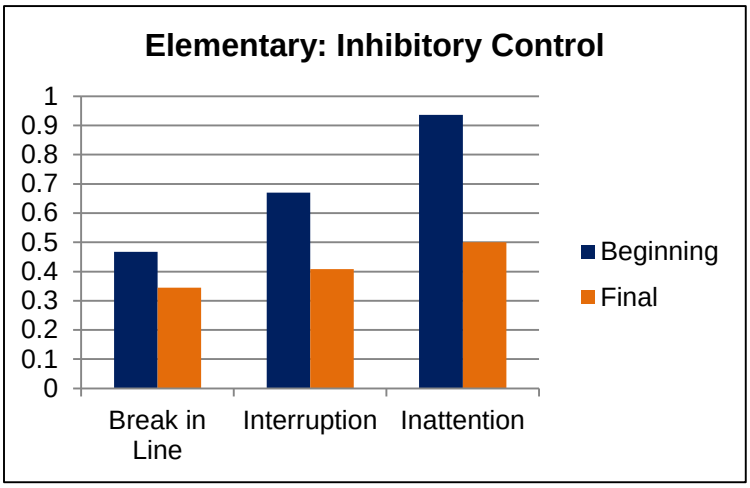
In the first administration of this task, most of Allegro’s students with disabilities were angry and frustrated as demonstrated by their acting out behaviors, sometimes trying to snatch the beanbag back from the instructor or another classmate. With frequent lessons about suppressing aggression, proper 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.

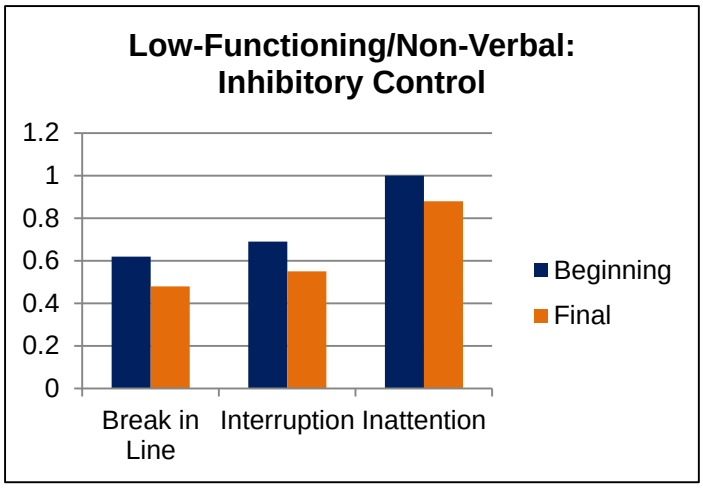
**Inhibitory Control**

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.***



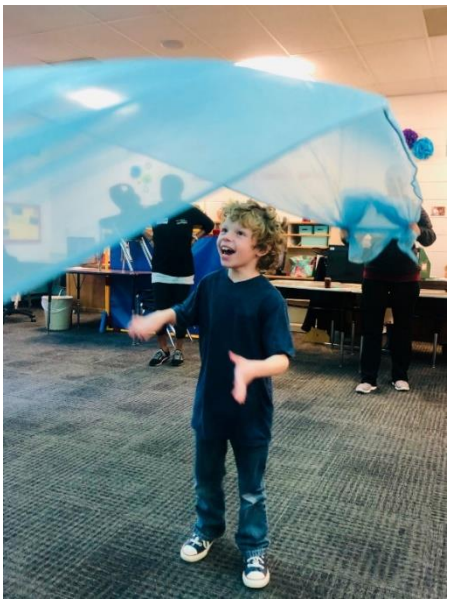



## Case Study
### Billingsville Elementary School

Allegro class enrollment: 18 children with disabilities
*Demographics: 14 African American, 2 Caucasian and 2 students with disabilities of Latino origin*

Volunteers: 18 one-on-one typically developing peer tutors, 4th and 5th grade students enrolled at Billingsville Elementary



Billingsville Elementary School is a lower performing elementary schools in the Charlotte-Mecklenburg Public School System. The North Carolina Board of Education's 2017-2018 School Performance Grades assigned a school performance grade of 49 and achievement score of 40.5 to the school as a whole. Billingsville's reading score was a 42 and math score was 52 vs. an average of 60 in both subsets statewide. In recognizing the need for supplemental education programs at this school specifically gear towards children with disabilities, Allegro Foundation offered a free-of-charge weekly movement education class throughout the 2018-2019 school year.

**Brian, 1st Grade Student at Billingsville Elementary School**

**Diagnosis:** Unknown developmental delays

How does this student manifest her disability?

- 50% of the time, Brian is over in the corner of the room, separate from the rest of the class, but still participating.
- Inattentive: when instructed "Brian wiggle your knees!", he turns his back and freezes until Allegro instructor is no longer paying attention to him.
- Learning delays in acquiring pre-literacy skills (numbers, counting, letters, anatomy identification)

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

- Allegro has helped Brian be more aware of what he is capable of doing. One of Brian's favorite movement education activities is "Animal Action". He has this song memorized; he knows what animal is coming next before the song even says it, demonstrating increased sequential learning.
- Brian has memorized characteristics about different animals, what the animal name's first letters are, and how to demonstrate the animals' motions with his own body.
- Brian has improved from his previous method of turning his back when his name is spoken in class. By the middle of the year, Brian was also performing this action when a new person came into the classroom that he was unfamiliar with. By June 2019, Brian grew comfortable with unfamiliar faces and instructors.

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

- Peer tutors did not immediately begin Allegro's program in the fall, but we're introduced in the winter months as Allegro's students progressed through the program. Initially, Allegro instructors were concerned about how Brian would adapt to the unfamiliar faces in the program, especially those tasked to work one-on-one with him to develop additional educational and movement skills. Fortunately, Brian adapted quickly and enjoyed participation with same-age typically developing children.
- "Brian is one of the most excited kids about Allegro that I have had in my three years of teaching. Always comes into class ready to "check in to Allegro", initiating the start of the weekly class!

## Case Study
### Rama Road Elementary School

Allegro class enrollment: 22 children with disabilities
*Demographics: 11 African American, 4 Caucasian, and 7 students with disabilities of Latino origin*

Rama Road Elementary School also evidenced lower school performance scores on recent school board assessments: School Performance: 59; Achievement: 50.9; Reading: 49; Math: 61, (2017-2018 school year), so Allegro Foundation identified a significant opportunity to impact the educational learning of children with disabilities at this school site.

**Kavon, 3rd grade student at Rama Road Elementary School**

**Diagnosis:** Sensory Motor Processing Developmental Delay, speech delay

How does this student manifest his disability?

- Tantrums when things do not go his way; does better knowing things ahead of time so he can prepare; afraid of new situations and people.

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

- Kavon learned that Allegro class was going to proceed with or without him. Allegro instructors were consistent with what they told him each week – that class would continue whether he participated or not, and if he chose to scream and yell, he would have to sit in the corner of the room by himself.
- Kavon was very challenging to work with most weeks. Something that he loved the week before would send him into a tizzy the next week, and you really had to work to understand what was bothering him.

- Kavon has learned some bodily autonomy and control through Allegro Instructors reminding him to keep his hands to himself, and reassuring him that he can do tasks on his own and he does not need help to accomplish things like moving his legs or jumping up and down.
- Kavon became much more self-soothing than he was at the beginning of the year. Allegro Lead often heard him mutter things to himself that she had previously said to him, like "you can do it on your own," "you're doing a great job," "keep your hands to yourself," and "keep going!"

## 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?*

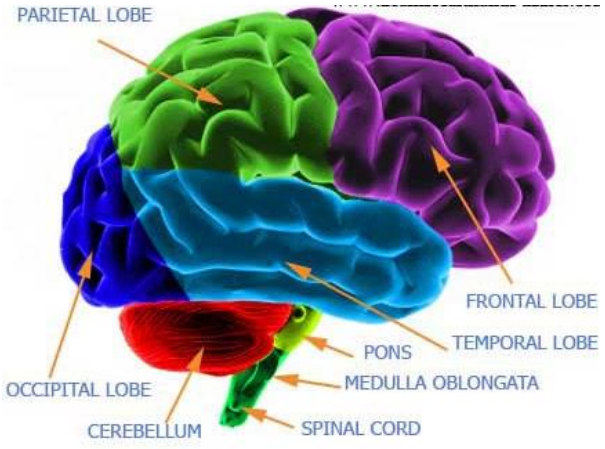
Because motor processing occurs in nearly all parts of the brain, the resulting muscle memory produces complex, neural networks for more efficient processing of a broad range of skills and abilities.

**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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