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Directed, Structured Fine Motor Activities and Handwriting Development

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Directed, Structured Fine Motor Activities and Handwriting Development

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Northwestern College

An Action Research Project Presented

in Fulfillment of the Requirements

For the Degree of Master of Education

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Abstract

The purpose of this actions research project was to determine if the Transitional Kindergarten students who participated in directed, structured fine motor development increased their handwriting skills compared to those who did not receive directed, structured fine motor skill assistance. The study consisted of assessing students handwriting skills using the Handwriting Without Tears – Beginning Print at the beginning of the year, mid-year, and the end of the year. The quantitative data revealed that students who participated in daily fine motor activities that are directed for specific fine motor needs, including: pincher grasp, pincer grasp, whole-hand, and letter/number formation saw an increase in their handwriting development than those who did not.

Directed, Structured Fine Motor Activities and Handwriting Development

Fine motor skills are significant in a young child's development (Memisevic & Hadzic, 2013). The development of these skills in children are needed in everyday activities such as zipping, buttoning, tying, and picking up little objects. These skills are also highly important in a child's classroom to draw, cut, and write. Unfortunately, many young students do not have proper fine motor control and will struggle with these everyday activities; but more so, with these academic fine motor skills.

Students may grapple with fine motor development for varying reasons, such as: the Central Nervous System (CNS) may not be fully developed, their muscle tone is weak, or they haven't been introduced to structured fine motor activities (Memisevic & Hadzic, 2013). Students who have not worked with these small muscle movements or those who may experience a delay in fine motor control, may not be able to inscribe in the classroom, which can lead to long-term declines in achievement and some behavior problems (Huffman & Fortenberry, 2011).

The four stages of fine motor development include: *whole arm* movements, *whole hand* movements, *pincher grasp* with the thumb, middle, and index fingers, and *pincer coordination* using the same three fingers (Huffman & Fortenberry, 2011). Pincher grasp and pincer coordination are closely tied to a child's handwriting capabilities. Research has found that grip and pinch strength does, in fact, develop with age; unfortunately, writing expectations in the classroom are increasing in primary education (Alaniz, Galit, Necesito, & Rosario, 2015). By providing materials and activities that support each stage of the fine motor development, a child's hand muscles will strengthen and these skills will become more natural (Huffman & Fortenberry, 2011). A teacher who introduces age-appropriate fine motor tools and activities lay

the foundation for their students in proper pencil grip, in handwriting, and in cutting and drawing skills.

The purpose of this study is to determine if a child's fine motor development and writing capabilities increases in students who get daily, structured fine motor activities compared to those who do not. The researcher evaluated students and their fine motor development using the Handwriting without Tears, Kindergarten – Beginning Print Administration Packet to screen students on their handwriting proficiency. Handwriting legibility was scored using the screener online tool on memory, orientation, and position. This paper will also explore the history of fine motor development, advantages of implementing fine motor activities, difficulties of those who struggle with fine motor skills, and possible interventions.

Ultimately, the researcher has discovered that incorporating fine motor activities into the classroom is an effective strategy for all students but the study strived to find out whether directed, structured fine motor activities increase handwriting development in Transitional Kindergarten students or not.

Review of Literature

Fine Motor Skill Development

Fine motor skill development is defined as the ability to control smaller muscles in order to grasp and manipulate smaller objects. These skills are important for all children as they use this precise visuomotor coordination and the movement of their hands each and every day (Simpson et al., 2019). Babies bring their hands to their mouths, toddlers use their hands to grab books, young children use their hands to button their coat, and school-aged children use their hands to color, draw, and write. The process of using these small muscles in the hands, as well as the visual-motor skills, come from the prefrontal cortex and cerebellum (Simpson et al., 2019) which are located toward the front of the brain. The prefrontal cortex carries out a person's executive function which can be defined as the ability to control thoughts, goals, consequences, predictions, and expectations. The cerebellum plays an important role of a person's motor control and contributes to the coordination of the sensory systems and other parts of the brain which can regulate these movements; specifically balance and small movements of the body and hands (Simpson et al., 2019). All that said, the brain of a child is formed within the womb and continues to form and mature throughout their baby, toddler, and early childhood years. This is the most important time to introduce various grasping and manipulating activities as it can have a greater effect on the development of fine motor skills in children (Memisevic & Hadzic, 2013).

Currently, early childhood teachers are encouraging motor development in their student's play and their academic learning time. Research tells teachers that fine motor development needs to be more intentional and specific for each student in order to prevent negative consequences and fine motor difficulties (Coates & Coates, 2015). An early childhood teacher should provide various materials and activities that require students to use their fingers and hand

muscles in a way that is advancing them toward a goal in mind. Examples of fine motor goals for Transitional Kindergarten, include: cutting along a line continuously, coloring inside the lines, tracing on the line with control, and writing all 26 capital letters.

Fine Motor Skill Development Advantages

As explained earlier, fine motor skill development begins at a very young age. The benefits of introducing babies to their hands, including their 10 fingers, and all that they can do, is essential for their development as they grow into school-aged children (Sher & Butler, 2009). The following studies have shown that fine motor and visual-motor intervention programs are effective for all preschool and lower elementary students (Ohl et al., 2013).

One study, put on by Ratzon, used a 12-week intervention strategy focusing on handwriting and fine motor performance skills in first grade children. Students exhibited poor fine motor control were put in the intervention group who were exposed to fine motor skill activities each day for 20 minutes. The results found that this group made significantly greater improvements in hand-eye coordination, copying of letters and shapes, and overall fine motor skills than their peers (Ratzon, Efraim, & Bart, 2007). This lends evidence that using short term intervention strategies in fine motor development, works. Along the same lines, a study was put on by Rule and Stewart, examining the effectiveness of six fine motor centers that were first introduced by the teacher with the purpose of strengthening the pincer grasp in kindergarten students (Rule & Stewart, 2002). These centers were closely coached by an adult as this was more effective than the mere exposure to daily fine motor activities. By providing activities in small groups, with an adult monitoring and intervening when needed, the fine motor/pincer grasp, can be strengthened. Another study, put on by Bazyk, measured the outcomes of fine motor skills in Kindergarten children both with and without disabilities throughout the school

year (Basyk et al., 2009). This research found that children with disabilities made significant improvements in two of the fine motor assessments; whereas, students without disabilities made significant changes in all eight fine motor assessments. This supports the effects of fine motor interventions on the general education classroom as well as the special education classroom.

The advantages of implementing hands-on activities each day for students requires them to concentrate and hone in on their fine motor skills are clearly beneficial according to the Montessori theory (Steward, Rule, & Giordano, 2007). This theory believes the hand leads the mind, which engages the child in a task fully focused on the required fine motor motions, and because of this, concentration increases; which is supported by numerous research studies. (Steward et al., 2007).

Fine Motor Skill Development Difficulties

Research suggests that students spend a significant portion of their everyday life performing a variety of fine motor activities including: eating breakfast, fastening their coat, playing with legos, coloring, and writing (Ohl et al., 2013). For students who struggle with these fine motor demands of their day, there are many difficulties that may arise. They may become upset when they cannot perform a task, they may begin to depend on others for help, or they may fall behind in school. Visual motor integration is so very important for students in their adjustment to the classroom socially, emotionally, and academically (Memisevic & Hadzic, 2013).

Students who are diagnosed with Downs Syndrome are at a higher risk of having cognition problems which can influence their performance on daily life activities as well as fine motor development (Lersilp, Putthinoi, & Panyo, 2016). That being said, students with Downs

Syndrome whose fine motor delays are not addressed, could become adults with problems in their bilateral hand coordination, hand prehension, manual dexterity, in-hand manipulation, and may develop low hand muscle strength (Lersilp et al., 2016).

Students with autism may also experience delays in fine motor development. A study was conducted by Alaniz and Galit on pinch and grip strength in children who are typically developing as well as children with autism (Alaniz et al., 2015). They measured the students' grip and pinch strength using a Sammons Preston Jamar hand dynamometer as well as a pinch meter. Both instruments ensure proper measurements and helped solidify the statement: Grip and pinch strength can development in children with autism and follow the same trends as typically developing children (Alaniz et al., 2015). After testing each child's grip and pinch strength using the Sammons Preston Jamar hand dynamometer as well as the pinch meter three consecutive times, values were averaged and the study found that both typically developing children and those with autism had shown that grip and pinch strength increased as their age increased; that being said, as the slopes are compared, children with autism showed greater variability as their ages increased (Alaniz et al., 2015). In conclusion, typically developing children's grip and strength scores may have started a bit higher than those with autism, but the developmental trends in both typically developing as well as autistic children increased at the same rate. Ultimately, students who struggle with fine motor skills are able to make gains in their development if they are given the tools and the assistance that corresponds with their specific fine motor needs.

Fine Motor Skill Development Activities

Teachers, and parents alike, should be encouraging this development of the small muscles in the hands using developmentally appropriate tasks. Before assigning fine motor activities, one

must first define the four stages of fine motor development for early writing success. They include: *whole arm*, *whole hand*, *pincher*, and *pincer coordination* (Huffman & Fortenberry, 2011).

As Huffman and Fortenberry (2011) explained, the first stage of fine motor development consists of whole arm skills. A teacher could help a young student reach this fine motor stage by tossing a bean bag to a specific area using the throwing movement. The student could also paint using a large brush and butcher paper. These full arm movement activities are a precursor to small muscle development of the hand (Huffman & Fortenberry, 2011).

Huffman and Fortenberry (2011) explain the second stage of fine motor development as it consists of whole hand skills. A young student could squeeze water from one bowl to another using a turkey baster or unscrew the spice jars and yogurt cups in the kitchen center. These activities are strengthening the whole hand and allows students to coordinate the finer movements of their five fingers (Huffman & Fortenberry, 2011).

Huffman and Fortenberry (2011) define the third stage of fine motor development as pincer skills; the coordination of the thumb and the index finger. A young student could clip clothespins around a paper plate or tear paper at a craft center in order to support this pincer development (Huffman & Fortenberry, 2011). Another activity that strengthens the pincer grasp is creating a necklace made of fruit loops. This will not only increase a child's fine motor skills, but also their ability to focus, eye-hand coordination, and visual and proprioceptive stimulation (Sher & Butler, 2009, p 123-125). Some variations include: use buttons, short pieces of straws, or macaroni pasta as these may be easier for a child to manipulate. An adult could also assist a child who cannot coordinate both hands by holding the string steady, and/or use pipe cleaners to turn the project from a necklace into a snake (Sher & Butler, 2009, p 123-125).

Huffman and Fortenberry (2011) describe the last stage of fine motor development as pincer control. At this stage, a young student has mastered the whole arm activities, whole hand activities, and pincer activities, and is now ready to properly grasp markers, crayons, pencils, and/or other writing utensils that are used to engage in authentic writing endeavors (Huffman & Fortenberry, 2011). This act of making a tripod with a child's thumb, index finger, and middle finger is highly coordinated and needed in order to begin the writing process. Activities such as: tracing over letters with a dry-erase marker or finding the correct key that matches the lock, are perfect for pincer control (Huffman & Fortenberry, 2011). Another activity that promotes pincer control while using a drawing tool is called: Drawing Faces (Sher & Butler, 2009, p 127-128). An adult would start with a pencil and paper and model how to hold the writing utensil using the tripod method and hold the paper down with their weak hand. Then the adult would model drawing a face while dictating exactly what is being drawn; for example, head, eyes, nose, smile, etc. The child is then encouraged to take the pencil, paper, use the tripod method, and copy the adult's drawing. Variations can be made by asking the child to guess which emotion is being drawn or assisting with the hand-over-hand method to help support their pincer control development (Sher & Butler, 2009, p 127-128).

Ultimately though, one-size or one activity does not fit all children (Isbell, p 7, 2010). Using an approach of starting all students at a specific fine motor developmental stage, will not be meeting the needs of all of the students (Huffman & Fortenberry, 2011). Development in children can come in waves; they are growing and changing all the time and their ability to do various fine motor and writing activities changes too. By getting to know students and finding out what they have and have not mastered in the fine motor realm, a teacher can build activities or begin writing interventions that are focused on a student's fine motor stage (Isbell, 2010).

Fine Motor Skill Development Interventions

Interventions should be based upon fine motor delays including: whole arm, whole hand, pincher, small muscle concerns, and handwriting/pencil grip concerns (Huffman & Fortenberry, 2011). Once delays are observed, an intervention specialist or Occupational Therapist should be contacted. Their role is to help a teachers, parents, and administrators develop programs in order to minimize fine motor development problems for individual students, classrooms, and schoolwide (Ohl et al., 2013). Services from occupational therapists have been found to help all children, with or without difficulties. Goals are written in order to improve their skills, especially fine motor and graphomotor skills, as well as their ability to perform daily living activities (Jasmin, Gauthier, Julien, & Hui, 2018).

Intervention specialists, or Occupational Therapists, are used in schools to make thorough evaluations of students who present needs in their motor control. These evaluations are especially desired in the Preschool and Transitional Kindergarten settings as results have indicated that the development of fine motor skills is accelerated when a child is 4 years old (Memisevic et al., 2013). Once an assessment or checklist is given to a student, subsequent rehabilitation, like eye-hand coordination and manipulation, should be implemented in order to improve these specific skills that were lacking on the assessment/checklist. The earlier these interventions are started, the better the outcomes and educational progress is. Other interventions that teachers, therapists, and specialists may suggest include: alternative instructional methodologies for students who have vast deficits, small-group skills remediation for those with similar fine motor needs, or individual instructional methodologies to give special attention to specific skills (Ohl et al., 2013). Whether the intervention is considered short-term (0-12 weeks) or long-term (12-28 weeks), evidence from research studies show that involvement

in fine motor activities for young students are very meaningful in equipping a child for upcoming handwriting ventures (Ohl et al., 2013).

Recently, various apps have been created to help facilitate a student's knowledge of letter names, sounds, and tracing and coping these letter shapes (Butler, Pimenta, Tommerdahl, Fuchs, & Cocola, 2019). Butler et al. (2019) mentioned that many schools have introduced tablets or Ipads to students as a way to supplement their existing handwriting practice. This way of implementing fine motor handwriting skills seems as though it is a feasible and engaging way of learning handwriting for young students (Butler et al., 2019). Ultimately though, a child still needs to develop these small muscles through playing with manipulatives by grasping, squeezing, buttoning, and zipping. However, Butler et al., (2019) admitted that there is little research on the outcomes of only using these apps in the context of handwriting fine motor skills. But, raising awareness to teachers and parents alike about the need for fine motor development both with technology and with manipulatives, will make a difference in the future of all students.

Handwriting History

Handwriting practice is a necessity for school-aged students as they need to learn how to write letters, numbers, and words correctly (Isbell, p 14, 2010). These handwriting skills translate into their writing in early childhood classrooms and then to the upper grades as they are asked to take notes and write longer papers (Schwellnus et al., 2012). However, in a class of 20, about 5-7 of typically developing children have some sort of delay or impairment, which can make handwriting difficult (Schwellnus et al., 2012). Handwriting can be a complex task as students are having to use their fine motor skills, cognitive, and psychosocial components together in one (Brossard-Racine, Mazer, Julien, & Majnemer, 2012). These handwriting

difficulties can also negatively affect a child's academic performance in other subjects as well as their self-esteem (Schwellnus et al., 2012).

Most handwriting difficulties stem from a child's "incorrect" pencil grasp (Schwellnus et al., 2012). Primitive grasps emerge from a young child as they use their whole forearm and hardly any fingers to move the pencil. Transitional grasps emerge next, as a child uses more of their wrist along with the thumb plus three or four fingers. Lastly, a mature grasp emerges in which the tripod grip controls the pencil. Schwellnus et al. (2012) identified four mature grasp patterns used for writing, including: the dynamic tripod grasp, the lateral (thumb) tripod, the dynamic quadruped, and the lateral (thumb) quadruped. Surprisingly, at the end of the study, it was concluded that there is no relationship between grasp and handwriting legibility when comparing the four mature grasps (Schwellnus et al., 2012).

A child may also struggle with handwriting fluency or Dysgraphia. This is defined as a transcription skill in which a child is able to weave together what is needing to be said and the sounds that are heard in a clear, smooth, and seemingly effortless way (Puranik, Patchan, Sears, & McMaster, 2016). Puranik also explains that children with this sort of writing deficit, need to be identified and have an intervention plan in place as soon as possible (et al., 2016). Students with this learning disability need to work on encoding, letter identification, as well as their fine motor development.

Puranik et al. (2016) studied a variety of young children and their ability to handwriting fluently. He assessed students using a timed alphabet writing fluency as well as untimed alphabet writing and wanted to find out whether one or both could be a valid predictor of early writing skills (Puranik et al., 2016). The results showed that the majority of children were unable to produce even two letters in 15 seconds at the beginning of their kindergarten year;

what's even more, by the end of the year, the same Kindergarten students were averaging only three letters in 15 seconds. In contrast, when untimed, Kindergarteners were able to produce many more letters at the beginning of the year: an average of 11 letters. At the end of the year, they were able to produce 17 letters with no worry of being rushed (Puranik et al., 2016).

The study also found that letter naming fluency makes a big impact on a child's ability to perform. If a child is unable to correlate the sound to the written letter, they will have troubles being fluent in their writing (Puranik et al., 2016). This deficit is normally very evident in a Transitional Kindergarten classroom as a majority of these young five-year olds are unsure of most letters and their corresponding sounds. A curriculum in which students are learning letters, sounds, and letter formation is essential in pushing students to thrive in their writing development.

Handwriting Without Tears

Handwriting Without Tears is a handwriting curriculum for grades Pre-K-2nd Grade that emphasizes developmentally appropriate writing strategies and uses clear demonstrations on how to form letters (Olsen & Knapton, 2016). It is research-based program that focuses on developmentally appropriate practices. The multiple multisensory letter writing tools help students create, draw, make letters in a way that begins with vertical and horizontal lines, then big and little curves. The curriculum suggests writing capital letters first as they begin at the top and are easier for children to recognize; but also teaches children to write their name in title case, as well as numbers, and the corresponding lowercase letters. Instruction is multisensory in the fact that teachers hand out wood pieces and a mat to promote tactile learning. They are also able to access to an Interactive Teaching Tool online that is loaded with songs, videos, and consistent handwriting language to promote auditory learning. Lastly, Handwriting Without Tears provides

numerous activities that are appropriate for kinesthetic and visual learners (Olsen & Knapton, 2016).

Developing handwriting skills as well as proper pencil grip are very important for young children before they begin writing letters, words, and sentences (Schwellnus et al., 2012). Through proper instruction and practice, a child can transform from scribbles and random contact with paper to a child using mature pencil grasp and the ability to write letters, shapes, and numbers easily (Olsen & Knapton, 2016). Handwriting Without Tears provides writing readiness skills including: fine motor skills, proper pencil grip, building letters and numbers step by step, writing capitals, lowercase, numbers, the student's name, and play writing (Olsen & Knapton, 2016).

In conclusion, Handwriting Without Tears is the ideal foundational writing curriculum for Transitional Kindergarten students because it emphasizes developmentally appropriate writing strategies and uses clear demonstrations on how to form letters, numbers, and name writing (Olsen & Knapton, 2016). This is the handwriting curriculum that is used in the researcher's Transitional Kindergarten classroom. The researcher was competent when using the Handwriting without Tears, Kindergarten – Beginning Print Assessment and it was familiar for the young students and very telling on their fine motor control and handwriting abilities.

Methods

Participants

The action research to determine whether directed, structured fine motor activities increase writing development in Transitional Kindergarten students, was conducted at Kinsey Elementary School, located in Sioux Center, Iowa. Sioux Center School District had 1,398 students enrolled in the 2019-2020 school year (Iowa Department of Education, 2020).

The Transitional Kindergarten classroom in which the research data was measured had 12 students. Of these 12 students, four of them are girls; eight are boys. Four of the students were considered White, seven of the students were considered Latino, and one was considered African American. Since Transitional Kindergarten is considered an intervention year, there were no students who receive ELL (English Language Learner) services, Title 1 services, or any on IEPs (Individualized Education Plans). There is one student who received Speech Therapy two times a week for 20 minutes a day.

Measures

The measurement tool being used to determine whether directed, structured fine motor activities increase writing development in Transitional Kindergarten students, is the Screener of Handwriting Proficiency from the Handwriting Without Tears curriculum (Olsen & Knapton, 2016). This assessment can be used to provide insightful data on a student's handwriting skills as well as areas in need of fine motor assistance. The administration of the Screener of Handwriting Proficiency only takes about 10-15 minutes and should be taken in the Fall (Beginning), Winter (Mid-Year), and Spring (End of Year) in order to review individual and class reports on letter memory, orientation, and placement.

The researcher was able to score the assessments using the Handwriting Without Tears – Screener online tool. The first printing skill, memory, is the ability to remember and write dictated numbers and letters. Memory errors are given when a student omits a letter/number, the letter/number is unrecognizable, or write the wrong letter/number. The second printing skill, orientation, is the ability to write numbers and letters facing in the right direction. Orientation errors are given when students write backward letters and numbers. The last printing skill, placement, is the ability to place numbers and letters on the bottom line. A student would get a placement error if the letter/number is more than 1/8” above or below the line. The student is also asked to write their name at the top and is scored according to which stage of handwriting development they use: all capitals, transitioning mix, or title case. The Screener online tool gives insight on individual handwriting performance and gives remediation options in fine motor control and writing skills. In the end, the student’s handwriting strengths and areas of remediation are generated by percentages. This data is quantitative.

Observations

The researcher also took anecdotal notes each month, beginning in September and ending in May, as students worked on fine motor activities in small groups and whole group. Some of the fine motor activities that continued to be practiced each month, were: ripping paper for crafts, painting with large brushes, sponges, and small water color brushes, sorting with tweezers, clipping with clothespins, cutting with scissors, and rolling with play-doh. The researcher was able to reflect on the fine motor skill being practiced and come up with new ways to integrate fine motor skills with the literacy, phonics, or math lessons.

The researcher created 12 fine motor bags, each working on a various skill, including: pincher grasp, pincer grasp, whole-hand, and letter/number formation. These fine motor bags

were being used in the classroom each morning for 20-30 minutes in the month of January as well as a being sent home with specific students in the month of February. Once a student brought back the fine motor bag, a new one would go home.

The fine motor bags that promoted pincher grasp, included: pom poms in parmesan cheese containers, rainbow with tiny colored pom poms and tweezers, and mini iron beads kit. The fine motor bags that encompassed the pincer grasp were: twisting nuts and bolts as well as warming up with a fat pencil, regular pencil, and golf pencil. The bags in which students used their whole hand to complete, included: hole punch and paper, munching tennis ball, roll a snake play-doh then cut with scissors, therapy putty with beads inside, and cutting practice - zig zag, swirls, straight lines, etc. Lastly, the bags that incorporated letter/number formation were: expo marker letter/number tracing and race car on letter/number race tracks.

Procedures

This action research plan was conducted in a half-day Transitional Kindergarten classroom. Students were assessed using Handwriting Without Tears Screener of Handwriting Proficiency – Beginning Print packet (Olsen & Knapton, 2016) in September, 2019. The researcher was able to get a baseline, or starting point, on nine of the twelve student's fine motor development. The nine students were assessed in a small group using individual privacy shields during small group time. This allowed students to give their full concentration when writing their name, capital letters, numbers, and lowercase letters. The data was reviewed and scored according to memory, orientation, and placement. Notes were taken on formation, size, neatness, speed, and posture/pencil grip. The Screener for Handwriting Proficiency had an expectation score of 63% for Memory, 62% for Orientation, and 58% for Placement (Olsen & Knapton, 2016). Unfortunately, eight of the nine Transitional Kindergarten students did not

know their letters (memory); therefore, they did not get a score for orientation or placement. Students were then provided with opportunities to build their fine motor skill development in small groups as well as in large groups in ways that were related to the monthly theme, including, but not limited to: ripping, painting, sorting, cutting, building, rolling, hole-punching, clasping, gluing, and decorating. This intervention lasted for 15 weeks with holidays and school breaks intermixed within.

In January, students were introduced to the 12 individualized fine motor bags during the 20-30 minutes of morning work time. These bags were used to prepare their fingers, small hand muscles, and pincer grip for writing. Students were able to choose the individualized fine motor bag that they wanted to exercise with each morning. This idea came from Steward (et al, 2007) which found that giving children a choice, they persist longer and attend more to that particular activity. This intervention lasted for 4 weeks.

In late-January, the Transitional Kindergarten students took the same Screener of Handwriting Proficiency - Beginning Print Assessment. At this point in the year, 11 of the Transitional Kindergarten students were assessed: eight were boys, three were girls. Four of the students were White, six were Latino, and one was African American. Again, none of the students receive ELL (English Language Learner) services, Title 1 services, or IEPs (Individualized Education Plans). One of the students did receive Speech Therapy two times a week for 20 minutes a day. The eleven students were assessed in a small group using individual privacy shields during small group time. This allowed students to give their full concentration when writing their name, capital letters, numbers, and lowercase letters. The data was reviewed and scored according to memory, orientation, and placement. Notes were taken on formation, size, neatness, speed, and posture/pencil grip. The Screener for Handwriting Proficiency had an

expectation score of 75% for Memory, 76% for Orientation, and 67% for Placement (Olsen & Knapton, 2016). Seven out of the twelve students were not making strides in fine motor control and were placed in the experimental group. This group, four boys and three girls, was given specific fine motor practice each day to strengthen their pincher grasp, pincer grasp, and whole-hand skills. They were also provided with the opportunity to take home an individual fine motor bag to practice with parents. The control group, consisting of four boys and one girl, were given the opportunity to practice with the fine motor bags in the 20-30 minutes each morning, but this was not directed, structured, teacher-initiated, practice. This intervention lasted for 4 more weeks.

In early March, the Transitional Kindergarten students took the Screener of Handwriting Proficiency - Beginning Print Assessment once more. At this point in the year, all 12 of the Transitional Kindergarten students were assessed: eight were boys, four were girls. Four of the students were White, seven were Latino, and one was African American. Again, none of the students receive ELL (English Language Learner) services, Title 1 services, or IEPs (Individualized Education Plans). One of the students did receive Speech Therapy two times a week for 20 minutes a day. The 12 students were assessed in a small group using individual privacy shields during small group time. This allowed students to give their full concentration when writing their name, capital letters, numbers, and lowercase letters. The data was reviewed and scored according to memory, orientation, and placement. Notes were taken on formation, size, neatness, speed, and posture/pencil grip. The Screener for Handwriting Proficiency had an expectation score of 88% for Memory, 86% for Orientation, and 75% for Placement (Olsen & Knapton, 2016). Most of the Transitional Kindergarten students were not yet scoring at the

expected percentages for memory, orientation, and placement but strides were definitely made in each of the three categories.

Results

The purpose of the study was to determine if the daily use of directed, structured fine motor activities increased writing skills in Transitional Kindergarten students compared to those who received typical fine motor activities tied to the curriculum in a regular Transitional Kindergarten program. Cameron's study of fine motor skills and executive function during the year before Kindergarten and how this can predict a student's achievement or academic difficulties (et al., 2012). The Transitional Kindergarten program is considered an intervention year for the 5- and 6-year old's who are enrolled. Most of these students come in with very little fine motor control and are unsure on how to write letters and numbers correctly. Fortuitously, over the course of this research, each students' handwriting and fine motor control improved. The degree to which each student improved was different as there are many factors, good and bad, that play into writing development.

The independent variable in this action research were the fine motor activities and whether they were structured and directed for the seven specific students or integrated in the day to day for all twelve of the Transitional Kindergarten students. The dependent variable was the Handwriting without Tears – Kindergarten Assessment that was taken at the beginning of the year, mid-year, and end of the year.

Beginning, mid-year, and end year test scores for the Screener of Handwriting Proficiency - Beginning Print Assessment were analyzed for individual students in an excel document. This shows a learning curve in each student's ability to remember and write each letter/number, the direction in which they began the letter/number, and whether they placed the letter/number on the base line, above it, or below it. This data is qualitative. Quantitative data was also recorded in the excel document on the improvement, or lack thereof, between the

beginning test, mid-year, and end year for individual students. The results of an average of the twelve students are presented in Table 1.

Table 1

Beginning, Mid Year, and End Year Test Results for Transitional Kindergarten Students

<i>Time of Year</i>	<i>MM</i>	<i>MP</i>	<i>MO</i>
Beginning	14%	4%	4%
Mid Year	56%	56%	53%
End Year	62%	70%	76%

Note: MM means average (mean) in Memory, *MP* means average (mean) in Position, *MO* means average (mean) in Orientation.

The beginning test scores were significantly low across the board in memory, position, and orientation because the 8 out of 9 students were unsure of how to write the capital and lowercase letters as well as numbers 1-9. This brought the average position and average orientation scores way down because what was written was scribbles, shapes, or nothing at all.

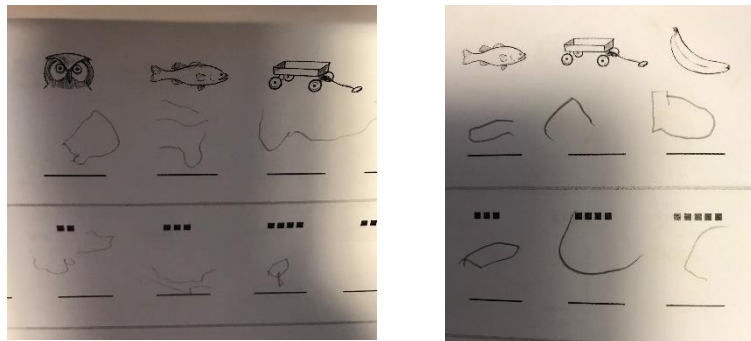


Figure 1. Two different student's beginning of the year Handwriting Without Tears – Kindergarten Assessments.

The mid-year class average did improve using fine motor activities as a group. Memory increased by 42%, orientation by 52%, and placement by 49%. This is not surprising as students had learned how to write all 26 letters and had just begun reviewing the capital letters as well as being introduced to lowercase letters. Writing numbers had not yet been introduced to the Transitional Kindergarten class.

Unfortunately, seven of the twelve students were still below the class average of 56% in Memory, 56% in Position, and 53% in Orientation. These 7 students made up the experimental group who received directed, structured, teacher-initiated practice with fine motor bags for 20-30 minutes each morning. Interventions were written and specific skills were practiced with the experimental group, including: pincher grasp activities, pincer grasp activities, whole-hand activities, and letter/number formation practice. Five students were placed in the control group who were able to choose a fine motor bag or quiet shelf activity each morning. The results of the mid-year assessment with the experimental group vs. the control group along with the end-year assessment are presented in Table 2.

Table 2

Mid Year and End Year Test Results for Experimental Group vs. Control Group

<i>Time of Year</i>	<i>GN</i>	<i>M</i>	<i># of P</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
Mid-Year	E	.34	7	.59	-1.37	12	.19	.40
End Year	E	.59	7	.71	-1.37	12	.19	.40
Mid-Year	C	.78	5	.10	-1.62	8	.14	.31
End Year	C	.87	5	.40	-1.62	8	.14	.31

An independent group t test revealed that there was not a statistically significant difference in the mid-year handwriting scores of the experimental group ($M = .34$, $SD = .59$, $n = 7$), as compared to the end year handwriting scores of the experimental group ($M = .59$, $SD = .71$, $n = 7$) following a medium group size, $t(12) = -1.38$, $p < .05$, $d = .40$. The results from the mid-year test ($M = .34$, $SD = .59$) and the end year ($M = .59$, $SD = .71$) handwriting scores indicate the intervention of directed, structured fine motor skill practice improved handwriting scores, but again, not a significant difference $t(12) = -1.38$, $p = .19$.

An independent groups t test also revealed that there was not a statistically significant difference in the mid-year handwriting scores of the control group ($M = .78$, $SD = .10$, $n = 5$), as compared to the mid-year handwriting scores of the control group ($M = .87$, $SD = .40$, $n = 5$) following a weak group size, $t(8) = -1.62$, $p < .05$, $d = .31$. The results from the mid-year test ($M = .78$, $SD = .10$) and the end year ($M = .87$, $SD = .40$) handwriting scores indicate that no directed, structured fine motor skill practice did in fact improve handwriting scores by 9% in the control group, but this is not a significant difference $t(8) = -1.62$, $p = .14$.

The data in Table 2 compares: (1) mid-year to end year assessments for the experimental group; (2) mid-year to end year assessments for the control group. The difference is statistically significant if the p -value is less than 0.05. Since the p -value is greater (.16 and .14) in both cases, the data is not statistically significant. The findings do show that there was an increase in handwriting assessment scores from mid-year to end year; more so in the experimental group than the control group. However, it was not statistically significant, suggesting that there was not an effect.

Nonetheless, the researcher did see improvements in pincer grasp and handwriting abilities from all students by the end of the year. By providing structured, directed fine motor activities for individual students each day, handwriting skills did improve as seen in Figure 2.

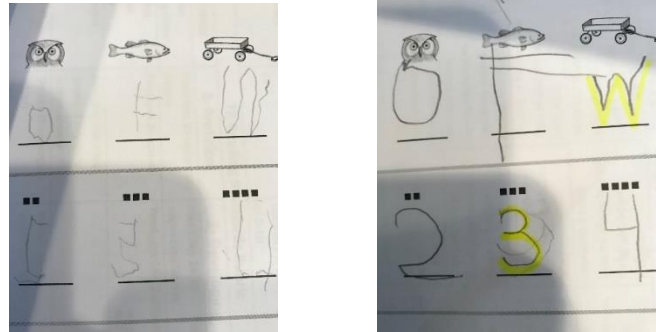


Figure 2. The same two student's end of the year Handwriting Without Tears – Kindergarten Assessment.

Discussion

Summary of Major Findings

This research project was conducted with Transitional Kindergarten students to compare the effects of using directed, structured fine motor activities for 20-30 minutes each day. It was determined that students who participated in directed, structured fine motor activities increased their fine motor skills compared to those who did not receive individualized fine motor attention. The quantitative data shows this in Table 1 as the memory, orientation, and position percentages increased and in Table 2 as the experimental and control group mean increased and the p-value was nearly statistically significant.

When comparing Figure 1 and Figure 2 it is easy to see the difference between the beginning of the year to the end of the year as the two students who wrote scribbles for the capital letters and numbers and progressed to actual letters and numbers by the end of the year. This supports the research on the importance of fine motor control in early childhood education.

Limitations

Due to classroom and time constraints, the ability to give students a longer period of time to practice fine motor may have limited the benefits of this study. With more time to invest in the students and their fine motor skills, the growth may have surged even higher than 84%.

The most significant limitation of this study was the small sample size. Only 12 students were a part of the study, 7 being the experimental group and 5 being the control group. With a small sample size, it can be difficult to gain statistically significant data. Sample size should be considered when interpreting the data of this study and/or when performing this same study on a larger population of students. In addition to the classroom size constraints, the findings of this

study cannot be generalized to all Transitional Kindergarten classrooms as some are part-time and some are full-day.

Another limitation that needs to be addressed, is that five and six-year-old children are constantly developing academically and physically. The researcher wondered what role their overall development plays into their writing progress. Some students progress much quicker than others and this may or may not sway the results for individual students.

Further Study

This study could be applied to various grade levels. It may be valuable in a kindergarten or first grade classroom before writing takes place as this could be a way to prepare the student's small hand muscles. That being said, future research could be applied to these students, ages six to seven, and the effects of their handwriting and ability to write for longer periods of time after implementing structured, directed fine motor activities. The researcher found that endorsing fine motor activities and providing interventions is so important to help grow a child's developmental skills, so applying a similar study to a three or four-year-old preschool may be beneficial as well.

By providing access to this study to educators who are involved in professional development at the researcher's school district or speaking at a local Teachers' Convention, the topic of fine motor activities and writing development can be reinforced as important for young students in the classroom.

Conclusion

The researcher found that numerous peer-reviewed research studies endorsed fine motor activities in the classroom (Huffman & Fortenberry, 2011); especially for young students as this builds a foundation in their fine motor development (Leonard & Hill, 2015). Students who struggle with pincer grasp because their grip is too loose would benefit from specific activities in which these muscles in their fingers grow stronger with each movement. Students who struggle with scissor cutting would benefit from specific opening and closing activities using whole-hand movements.

The findings from this study also supported the use of pincher grasp, pincer grasp, whole-hand, and letter/number formation activities in the Transitional Kindergarten classroom. Implementing activities in the curriculum (ripping paper for a pumpkin project, clothespin letter matching, or water paint with small brushes) for all students is beneficial as this builds these fine motor skills. Nonetheless, the researcher also found that providing individualized fine motor bags that are customized for specific students and their fine motor needs is even more beneficial. Fine motor control is crucial for students as they continue on in their handwriting, so building these foundational skills and determining an effective way to implement them within the classroom each and every day will not only increase a child's writing development, but also their confidence in themselves and their academics skills.

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