

The Effects of Directed Fine Motor Activities on Kindergarten Students

by

Amanda Strevig

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Abstract

The purpose of this study was to determine if kindergarten students who participated in structured fine motor activities increased their fine motor skills as compared to students who received instruction in a regular kindergarten program with no additional activities related to fine motor development. The intervention included fine motor activities such as cutting, writing/drawing, and manipulation of small objects. The study consisted of two groups of students with delayed fine motor skills. The students in each group were identified as having fine motor delays by their classroom teacher using the Teacher Observation of Learning, TOOL. A pre and post-test quasi-experimental design was used to examine the effects of the intervention program on the students' fine motor development. The measurement used in the pre and post test was the Peabody Developmental Motor Scales second edition, PDMS-2. Statistically significant gains in fine motor development were noted in the intervention group's post-test scores for both visual motor integration and grasping. The research supported that a directed intervention program for developing fine motor skills would make a significant impact in students' motor development. Further research needs to be conducted to see if the results of this study are long lasting.

CHAPTER I

INTRODUCTION

Small motor skills are essential skills that allow children to accomplish academic and pre-academic tasks such as using pencils and writing their own names. (Chandler, K., West, J. & Hausken, E, 1995) Underdevelopment of these small muscle groups can affect every aspect of a child's life from dressing to feeding to using writing instruments. The problem can then lead to children being dependent on others and developing problems in school. If the problem goes unaddressed for a prolonged period of time, then children can exhibit behavior problems and lower achievement, with some students exhibiting "intense personal feelings of failure" and a "worrying amount of dissatisfaction with those whose job it was to teach them motor skills" (Rule and Stewart, 2002, p. 9). The researcher found a generous amount of information supporting the negative effects that underdeveloped motor skills can have on students' performance in school, but little research was found on possible solutions to the problem.

Through observations of kindergarten students, the researcher has noted that the natural maturation of fine motor and gross motor skills occurs rapidly in kindergarten. Many students come to school with little writing experience and leave writing whole paragraphs. At the same time, if there is a delay in the natural maturation of these skills a developmental gap can occur quickly. In just one short year a child can begin a downward decline that can lead to achievement and behavioral struggles that can follow that child on to adulthood.

Decline in Fine Motor Skills

There was a time when children walked to school and played outside all year round. They were allowed to climb, jump, and ride their bikes every day. Those days have been replaced with earlier entrance into schools, structured activities, television or other electronic babysitters, and an earlier expectation for children to demonstrate the ability to perform paper and pencil activities. This cultural swing to a more sedentary lifestyle has impacted parents, teachers, and schools' perspectives on what skills should be taught in the early years. The cultural change and shift in priorities has left fine motor development skills in many classrooms unaddressed, resulting in declining student performance.

The same changes have been observed by the researcher in her kindergarten classroom over the past few years. Students' ability to cut, write, draw, and manipulate small objects has worsened over the years. At the same time, students' academic abilities have increased. For example, the average kindergartener can identify more letters, more words, and demonstrate more basic reading skills than just a few years ago. The shift from a hands-on environment to a more paper and pencil world has left many children behind. While an increase in students' academic abilities is a positive change, the decrease in student's fine motor skills cannot be overlooked. The mastery of fine motor skills is still essential for children to succeed in school.

Activities that Support Fine Motor Development

Rule and Stewart (2002) determined most kindergarten classrooms are rich with fine motor activities but results show that more are needed. Carefully constructed and coached activities are shown to be the most beneficial in this study.

There are three main areas that need to be developed in order to increase students' fine motor development: cutting, writing/drawing, and manipulation of small objects. In each area there are a variety of activities used to develop each skill. Cutting begins with freehand cutting and evolves to a more structured activity of cutting out shapes using different materials. Writing/drawing also starts out with open ended activities and slowly develops into tracing, copying, and creating with different writing instruments. Manipulation of small objects starts with sorting or stacking using one's own fingers and gradually becomes more difficult by using tweezers and tongs.

Statement of the Problem

Participation in structured fine motor activities will increase the fine motor skills of kindergarten students.

Hypothesis

Kindergarten students who participated in an intervention that included fine motor activities such as, cutting, writing/drawing, and manipulation of small objects will show an increase on a motor skill assessment as compared to a group of similar students that received instruction in a regular kindergarten program with no additional activities related to fine motor development.

Operational Definitions

Kindergarten: a program or class for 5 to 6 year olds that serves as an introduction to formal schooling.

Fine Motor Skills: fine motor skills, also known as small motor skills, refer to movement skills that use the small muscles of the hands for writing, drawing, and cutting.

Motor Skill Activities: modeling, cutting, writing/drawing, and manipulation of small objects are skills that develop motor skills

Motor Skill Assessment: Peabody Developmental Motor Scales second edition (PDMS-2) (Folio & Fewell, 2000) is composed of six subtests that measure interrelated motor abilities that develop early in life. It was designed to assess the motor skills in children from birth through 6 years of age, and reliability and validity have been determined empirically.

CHAPTER II

REVIEW OF THE LITERATURE

“Fine motor development does not come easily or naturally to some children” (Cantu, 2004, p. 1). Just as reading or math, students require instruction with their fine motor skills to reach their full potential. “Thanks to the mistaken notion that children don’t need help in this area, many children never achieve mature patterns for many motor skills” (Pica, 2003, p. 96). Small motor skills are essential skills that allow children to accomplish academic and pre-academic tasks such as using pencils and writing their own names (Chandler, K., West, J. & Hausken, E, 1995). “Children who have difficulty coordinating the small muscle groups in their hands have difficulty dressing, feeding themselves, and manipulating pencils, crayons, and scissors. This difficulty makes children dependent on others, opens them to peer ridicule, and prevents them from meeting the demands of school” (Rule & Stewart, 2002, p. 9).

This review of the literature will explain the appropriate fine motor skills for different age groups, discuss why these skills are important, examine possible reasons for a deficiency in this area, and discuss how this affects academics and what can be done to help fix the problem.

Fine Motor Skills by Age Group

Fine motor skills, also known as small motor skills, refer to movement skills that use the small muscles of the hands for writing, drawing, and cutting. Gross motor skills or large motor skills are movement skills using large muscles for running and jumping. Many articles and researchers combine fine and gross motor skills together and refer to them as motor skills (Pica, 2003).

Children need to have different fine motor skills at different stages of development. As children mature, their fine motor skills develop and this allows them to manipulate a wider range of materials. Teachers and parents need to be aware of their children's abilities so that they do not frustrate or tire them (Poole, Miller & Church, 2005).

Toddlers can be expected to reach and transfer objects from hand to hand. They should also demonstrate a raking motion as an immature grasp and begin to poke and point. By 12 months children will experiment with the pincer and other grasps for holding cups, balls, scoops, and containers (Poole, et al. 2005).

Preschoolers develop their skills predominately through drawing, cutting, pasting, pressing, and pinching. These skills develop dexterity, coordination, and muscles in their hands. For example, preschoolers may cover an entire piece of paper with large strokes but have enough hand-eye coordination to stay on the paper. Preschoolers also enjoy patting, squeezing, and molding play dough and damp sand (Poole, et al. 2005).

By the time children are school age, they have refined their grasp and manipulate writing and cutting tools more accurately. Their drawing and writing techniques have improved. Their speed, strength, precision, and coordination have increased (Poole, et al. 2005).

After completing kindergarten most children can write letters and some words. They can also copy, draw basic shapes, and they have demonstrated hand dominance (Poole, et al. 2005).

The Importance of Fine Motor Skills

Barton, Fordyce, and Kirby, as cited in Pica (2003), state in a journal for physical education teachers that “motor skills are not only critical life skills that enable us to go about our daily lives effectively and safely; motor skills are also important determinates of our ability to participate in our culture, and develop and maintain a physically active lifestyle” (p. 97). In addition, motor skills allow children to participate in movement activities that contribute to their physical and cognitive growth. Competence in motor skills is important to the positive emotional development of children.

Kindergarten is one of the most important years in a child’s motor development. Poole, Miller and Church (2005) state in an article outlining the emerging physical skills of young children that “the development of physical skills that use both small and large muscles during kindergarten represents one of the biggest growth spurts of the early years” (p 3). Children enter kindergarten demonstrating very simple physical abilities and over one year these skills develop into very complex ones. (Poole, et al. 2005) One of the fine motor tasks needed for school success is the pincer grip. Students need to develop this grip to perform basic activities like buttoning, tying shoes, writing, and drawing (Rule & Stewart, 2002). Efforts need to be made to develop these highly important skills in students’ early years of education so a deficiency in these skills does not hinder them later in life.

While substantial evidence has been shown to demonstrate the importance of developing fine motor skills in a child’s early education, researchers have also examined the benefits of these skills in relation to brain development, academics, and as predictors of future learning. Evidence suggests that increased motor activities have a strong effect

on a child's ability to learn and are beneficial in brain development. Poole et al. (2005) state that "they not only improve the child's ability to write but also in reading and thinking. Research shows that small-muscle movements build synaptic connections in the brain" (p. 3).

In the article, "Who Becomes an "At-Risk" Student? The Predictive Value of a Kindergarten Screening Battery," Roth, McCaul, and Barnes (1993) discuss the connection between kindergarteners' scores on a battery of tests in relation to the rates of retention, referral to special education, and placement in special education. If an effort to seriously attack the problems with at-risk children is going to be successful, then early intervention is essential. Intervention needs to begin before educational problems develop.

One of the findings in this study showed that fine motor modalities were one of the significant predictors of students' reading achievement in the spring. "The scores on the fine motor modality was consistently found to be a strong predictor of retention, referral, or placement in special education" (Roth, et al. 1993, p 348). Therefore, kindergarten students who received low ratings in these modalities could be considered potentially at risk. This information allows educators to include another group of skills as determinants of a student's success in school and further stresses the importance of developing these skills at an early age.

Underdeveloped Motor Skills

"Once upon a time children ran and skipped and climbed trees, jumped rope and played hopscotch and rode bicycles for blocks, children were never indoors," recalled Pica in his book titled *Your Active Child* (2003, p. 5). Today, children often are in child

care from the time they are infants, and they start school earlier. Their days are organized with limited time to just play; they do not walk to school; they are driven everywhere; even preschoolers and kindergarteners are expected to do homework. The meaning of just being a kid has changed over the years. Now, a child's life is not complete without handheld electronic games, computers, computer games, videos and video games, and of course, television. "It is estimated that between the ages of two and seventeen children spend an average of three years of their waking lives watching television" (Pica, 2003, p. 9).

Besides the obvious changes in lifestyle, there are many other factors contributing to the decline in students' fine motor development. They range from parent priorities, school priorities, and changing cultural dynamics. Diamond, Reagan, and Bandyk (2000) noted that, "parents don't value sitting still, sharing, and using a pencil as important skills for entering kindergarten. Parents ranked counting, reading, and writing as more important" (p. 1). At the same time, schools have provided less recess time, less physical education and have discouraged movement in the classroom. With both parent and school priorities moving towards more academic skills, it is no wonder students' motor skills are underdeveloped. Pica (2003) cited a study that looked at 15 different counties and compared teacher and parent views of important skills for kindergarten. Neither group felt responsible for helping children develop their fine motor skills. Evidently motor skills develop without adult supervision according to this study. Fortunately motor skills do develop with maturity in most cases, but not all the time. In addition, cultural dynamics are changing daily. There are growing concerns about how an increasing number of today's children are considered to be at risk for school failure (Davis &

McCaul, as cited in Roth, McCaul and Barnes, 1993). According to Cattreall and Cota-Robles (as cited in Roth, McCaul, & Barnes) the numbers of homeless children, children living in poverty, and children with English as a second language are expected to increase. Estimates currently place 20 million school-aged children at risk for these reasons.

The effects of gender, race, and ethnicity on the development of fine motor skills have been examined. Parents and teachers need to be aware that girls have a small advantage over boys in acquiring small motor skills. The differences in motor skills among races and ethnic groups are not substantial (Chandler, et al. 1995).

Other factors that affect motor skills are the medical issues that children possess. Over four million Americans live with developmental delays or disabilities and 17% are children under the age of 18. These children are not meeting their developmental milestones during the expected time frames. Cerebral palsy, Down syndrome, muscular dystrophy, and juvenile rheumatoid arthritis are examples of conditions that affect fine motor development (Cantu, 2004).

The Effect on Academics

“The improvement and mastery of small-muscle skills has a big impact on children’s success in school,” state Poole, Miller, and Church in their article about children’s physical development (2005, p 3). They continue to explain how the transition from kindergarten into first grade requires students to move from a hands-on environment to a more paper and pencil world. Students need to acquire these fine motor skills while they are in kindergarten in order to be successful with the writing, cutting, and drawing

demands of first grade. A deficiency in these skills leaves a lasting impact on many students' lives.

Sweedler-Brown, as cited in Rule and Stewart (2002), revealed that clumsy children find academic tasks such as handwriting and manipulating equipment difficult. Rule and Stewart took that research one step farther and concluded "clumsy teenagers reported that throughout their education, schools showed little interest and provided little help" (p.9). These feelings related to the deficiency in fine motor skills contribute to behavior problems, lower achievement, and some exhibiting an "intense personal feeling of failure" and a "worrying amount of dissatisfaction with those whose job it was to teach them motor skills" (p.9). To make matters worse, the research also found that "hand writing legibility influences teachers' perceptions of students' academic competence" (p. 9).

As stated above, Roth, McCaul, and Barnes (1993) found that students' performance on a battery of tests including fine motor skills proved to be a valuable predictor when identifying at risk students. Bergert (2000) continued research on this same subject and found problems with fine motor skills can be a warning sign for learning disabilities. Difficulty manipulating small objects, trouble learning to tie shoes, button shirts, or perform other self-help activities in addition to drawing or tracing, difficulty copying, and poor handwriting are all indicators of a larger problem. These observations need to be an alert for early detection and early intervention.

Rule and Stewart (2002) cite many other findings that make a moderate to strong connection between students' fine motor abilities and early literacy performance. Given

the impact of these findings, they were alarmed at the limited quantitative research available on exploring types of fine motor skill interventions and their effects over time.

Increasing Fine Motor Skills

Activities to promote fine motor development need to be geared toward the students' developmental levels not their age levels (Cantu, 2004). As mentioned earlier, parents and teachers need to choose activities that do not tire or frustrate young children. One solution is to provide materials for different skill levels. For example, parents and teachers can provide multiple types of balls, such as rubber, spongy, fluffy, or light (Poole, et al. 2005).

Crafts are an alternative or addition to the use of developmental toys. "Craft projects benefit fine motor development, postural alignment, positions, cognition, psycho-social skills, and organization" (Cantu, 2004, p. 1). Puzzles, peg boards, bead to string, construction sets, art materials, dramatic play props, and sand and water items are all materials that promote fine motor development (Bredekamp, 1990). In addition to providing these supplies for students, teachers and parents can build movement into routines throughout the day by having students sing action songs, help carry heavy items, and scrub tables (Poole, et al. 2005).

The use of scissors also can have the power to improve fine motor skills and support hand-eye coordination (Suzanne, 2005). The most beneficial use of scissors is freehand cutting because it offers students a choice, allows their own ideas to evolve, and sets the atmosphere for flexible thinking.

Different activities and supplies are more appropriate and beneficial for different developmental stages. Typically, toddlers benefit most from selected craft activities that

enhance dexterity, coordination, and strength of grasp patterns. Playing with sand scoops, sifters, containers, rollers and pudding paints and scribbling with crayons or magic markers are all appropriate activities (Cantu, 2004).

Preschoolers' craft materials might include paint, paper of various colors, shapes, and sizes, glue, blunt-nosed scissors, chalk, fabric of various textures, large beads and cord, and materials from nature such as bark, leaves, flowers, and colored stones. School-aged children benefit from modeling clay, models, paint projects, needlepoint, drama props, and costumes. Collecting stamps, shells, and any other little treasures can promote small muscle development. Projects like woodworking, copper tooling, gardening, and journaling can also be beneficial (Cantu, 2004).

Another source of beneficial developmentally appropriate activities, according to Rule and Stewart (2002), is Montessori schools. Montessori schools emphasize the care and management of the environment as the primary means for children to refine their motor skills. The schools' philosophy supports that a properly prepared environment provides opportunities for students to carry out real work with a practical objective. For example, students could be engaged in moving or washing child-sized furniture, polishing shoes or silverware, and cutting foods. Other activities might include using spoons, tongs, ladles or tweezers.

Rule and Stewart (2002) also determined that the nature of the fine motor activity, not the amount of activity, was what resulted in increased performance. Most kindergarten classrooms are rich with fine motor activities, but results show that more are needed. Carefully constructed and coached activities are shown to be the most beneficial.

Conclusion

It has been established and supported that fine motor development is an area that needs to be addressed in schools. A deficiency in fine motor skills can be an indicator of other problems, can have lasting, damaging effects on students' lives, and can sway other's opinions of students' academic performance. Early intervention is critical in stopping the downward spiral in students' fine motor abilities.

CHAPTER III

METHODS

The purpose of this study was to determine if kindergarten students who participated in structured fine motor activities increased their fine motor skills as compared to students that received instruction in a regular kindergarten program with no additional activities related to fine motor development.

Design

The research was a quasi-experimental design. While random assignment of students and groups was not possible, the researcher compared two intact groups of students. The treatment group participated in structured activities over a 6 week period while the comparison group did not. Both groups received the pretest and posttest.

Participants

The school in which the study was conducted was located in Glen Burnie, Maryland in a low socio-economic area. The school was classified as an “Academic Achievement for All” school, meaning more than 25% of students received free or reduced meals. The school had 291 students enrolled for the 2009-2010 school year at the time of the study. The school’s student population was 57% Caucasian, 24% African American, 7% Asian, and 12% Hispanic. In addition, 11% received special education services, and 35% received free or reduced meals.

The participants in the study were 5 and 6 year old children entering kindergarten in September, 2009. The students were split into two equivalent classes. Students’ gender, ethnicity, and neighborhood were considered when the two classes were constructed in order to ensure that both classes equally represented the population. From

these two classes, two smaller groups of students were formed. One group was assigned as the control group and one was assigned as the experimental group by the researcher. The control group consisted of 5 students, 4 boys and 1 girl, all Caucasian. One student received special education services. The experimental group consisted of 6 students, 5 boys and 1 girl. Of these 6 students, 4 were Caucasian, 1 was African American, and 1 was Hispanic. One student also received ESOL services.

The nature of the study was to provide an intervention for students with underdeveloped fine motor skills. The two kindergarten teachers were instructed to use the Anne Arundel County Public Schools form for recording young students' progress titled, Teacher Observation of Learning, TOOL (Anne Arundel County Public Schools, 2009). Every kindergarten teacher in Anne Arundel County is trained in using this form through extensive professional development. During the first three days of kindergarten, the teachers were instructed to observe their classes and score each student's fine motor skills according to the criteria stated in the TOOL. Each student could earn a **CD**-Consistently Demonstrates skills/behaviors independently, **PR**-Progressing in the development of skills/behaviors with teacher guidance and support, or **ND**-Needs Development. All students scoring a ND in the area of fine motor development were considered for the study. From those students that scored a ND only 5 students from each class were selected.

Instruments

The first instrument used in this study was the Teacher Observation of Learning, TOOL. The TOOL is an instrument that teachers use to evaluate and report on young children's performance while in school. The teacher's observations were guided by a

group of exemplars that ensure that all teachers hold students to the same level of competency. Teachers used the observations made in the *Physical Development and Health* section under “demonstrates fine motor skills” to determine the participants in the study.

The second instrument used in this study was the Peabody Developmental Motor Scales second edition, PDMS-2 (Folio & Fewell, 2000). PDMS-2 was used as the pretest and posttest for the treatment and comparison group. The assessment has five subtests all related to motor development. Only two of the five subtests were used in this study, “grasping” and “visual-motor integration.” The scores from these two subtests were used together to calculate a student’s fine motor quotient, FMQ. The FMQ is considered to be one of the most reliable scores in the assessment.

Procedures

Students registered for kindergarten were split into two equivalent groups. Both kindergarten teachers observed and recorded information on the TOOL related to fine motor development for the first three days of school. Using the information recorded on the TOOL, both kindergarten teachers selected 5 students that scored ND in the ability to demonstrate fine motor skills. This resulted in two groups of students totaling 10 participants.

Over a 2 week window the participants were tested using the PDMS-2. The grasping and visual motor subtests were used. The minimum age of participants was 5 years old, so each subtest was started at the test item recommended for a child 70 months of age. Item number 21 for grasping and item number 66 for visual motor were the starting points for the test. Testing procedures were followed to calculate a raw score for

each test. Using the PDMS-2 Profile and Summary Form the examiner calculated the raw scores for each test to find the Fine Motor Quotient, FMQ.

After all participants were tested, a 6 week intervention program began with the treatment group. The control group participated in the regular kindergarten program with no additional activities related to fine motor development.

Intervention

The intervention was a 6 week long program designed by the researcher based on the activities assessed in the PDMS-2 and additional activities proven to develop fine motor skills. The intervention was provided 4 days a week during the kindergarten students' center time or free choice time for approximately 15 minutes each session. Each 15 minute session was broken into three 5 minute sections: cutting, writing, and manipulation of small objects. During each session the teacher was engaged with the students by modeling proper grasp and use of the tools, providing feedback on each student's performance, and providing positive support.

The 6 week period was broken up into three 2 week sections to allow for the activities to gradually increase in difficulty. In weeks one and two for cutting, the teacher focused on proper grasp and use of scissors, and free hand cutting was practiced using copy paper, construction paper, and tissue paper. In writing/drawing, the teacher focused on the proper grasp of the writing instrument. The goal was for the writing instrument to be between the thumb and pad of the index finger, resting on the first joint of the middle finger as stated in the scoring criteria of the PDMS-2. Students drew and colored simple pictures of their choice. For example, students drew pictures of themselves, houses, and items in the classroom. Unlined paper, pencils, crayons, and markers were used. To

practice manipulation of objects, the teacher had students pick up cubes and pellets and place them in small containers using their fingers. The teacher varied the activity by having the students pick up one, two, or three items at a time and also encouraged the students to do the activity quickly.

In weeks three and four, for cutting, the teacher continued to instruct and guide the students in the proper grasp and use of scissors. Students cut on straight and curved lines. Students also cut out simple shapes like circles, squares, and triangles. Only copy paper was used. In writing/drawing, the teacher continued to instruct and guide students in the proper grasp of the writing instruments used. Students traced lines, connected dots, and traced simple shapes like circles, squares, and triangles. Pencils, crayons, and markers were used. To practice manipulation of objects, the same materials used in the first two weeks were used again. Now students used tweezers, instead of their fingers, to put the objects into containers. Lacing of basic shapes was introduced. In weeks five and six, for cutting, the teacher continued to instruct and guide the students in the proper grasp and use of scissors. Students continued to cut straight lines, curved lines, and basic shapes. Construction paper, tissue paper, fabric, and tag board were used. Folding paper in half and in quarters was introduced and practiced. In writing/drawing, the teacher continued to instruct and guide students in the proper grasp of the writing instruments used. Students copied basic shapes drawn by the teacher, cross, square, circle, and triangle. Simple letters, such as X, H, and T were also copied.

At the conclusion of the six week intervention all participants were given the posttest from the PDMS-2 during a two week window. The grasping and visual motor subtests were used. Item number 21 for grasping and item number 66 for visual motor

were the starting points for the posttest also. Testing procedures were followed to calculate a raw score for each test. Using the PDMS-2 Profile and Summary Form, the raw scores for each test were calculated to find the Fine Motor Quotient, FMQ.

CHAPTER IV

RESULTS

The purpose of this study was to determine if kindergarten students who participated in structured fine motor activities increased their fine motor skills as compared to students who received instruction in a regular kindergarten program with no additional activities related to fine motor development.

Pre and post test standard scores for Visual Motor Integration, Grasping, Sum of Standard Scores, and Fine Motor Quotient were analyzed for the experimental and control groups using a *t* test for independent groups. The results are presented in Table I.

Table I

Pre and Post Test Results for Experimental and Control Groups

	Measure Standard	Group	Mean	Number of participants	Standard Deviation	<i>t</i> test	Significance
Pretest	Visual Motor Integration	Experimental	8.5	6	0.84	1.72	0.119
		Control	7.6	5	0.89		
	Grasping	Experimental	2.8	6	0.41	0.81	0.438
		Control	2.6	5	0.55		
	Sum of Standard Scores	Experimental	11.3	6	0.51	2.72	0.022*
		Control	10.2	5	0.84		
Fine Motor Quotient	Experimental	74.0	6	1.55	2.76	0.022*	
	Control	70.6	5	2.51			
Posttest	Visual Motor Integration	Experimental	12.3	6	0.82	8.69	0.000*
		Control	8.6	5	0.55		
	Grasping	Experimental	7.3	6	2.25	2.40	0.040*
		Control	4.4	5	1.67		
	Sum of Standard Scores	Experimental	19.7	6	2.25	5.02	0.001*
		Control	13.0	5	2.12		
	Fine Motor Quotient	Experimental	99.0	6	6.75	5.02	0.001*
		Control	79.0	5	6.34		

*P. < 0.05

The pretest results for sum of standard scores and fine motor quotient were significant. A follow up analysis of covariance was conducted; the post test results were still significant

Analysis

The hypothesis stated that kindergarten students who participated in an intervention that included fine motor activities such as, cutting, writing/drawing, and manipulation of small objects will show an increase in fine motor development as compared to a group of similar students that received instruction in a regular kindergarten program with no additional activities related to fine motor development. The hypothesis was supported for all measures.

CHAPTER V

DISCUSSION

The purpose of this study was to determine if kindergarten students who participated in structured fine motor activities increased their fine motor skills as compared to students who received instruction in a regular kindergarten program with no additional activities related to fine motor development. Specifically, it was hypothesized that kindergarten students, who participated in an intervention that included fine motor activities such as, cutting, writing/drawing, and manipulation of small objects, will show an increase in fine motor development as compared to a group of similar students who received instruction in a regular kindergarten program with no additional activities related to fine motor development. As reported in chapter four, the results indicated that the research hypothesis was supported in all areas.

During the administration of the assessment the researcher noted that many of the students in the control group demonstrated a greater delay in fine motor skills as compared to the experimental group. The pretest results showed a significant variance between the experimental and control groups for the sum of standard scores and fine motor quotient. A *t* test for independent groups and analysis of covariance were used to analyze the sum of standard scores and fine motor quotient. Analysis of covariance analyzed posttest scores controlling for pretest and posttest means between the experimental and control groups. The posttest scores for the experimental group for both fine motor assessments were still statistically significant.

Implications

The research supported that a directed intervention program for developing fine motor skills would make a significant impact in students' motor development. With the knowledge of how important it is to intervene early and that an intervention would increase students' development significantly, the researcher can now promote the fine motor activities used in the intervention as valuable activities. Cutting, writing, drawing, and manipulation of small objects are activities that belong in the kindergarten classroom.

The first step in applying the information gained from this study is to inform early childhood educators at the researcher's school as to which activities supported the development of fine motor skills. While a directed intervention program may not be possible nor needed, the knowledge of what types of activities promote fine motor development would be valuable. The researcher found that many of the activities included in the intervention program could be easily included throughout the school day. Hamilton, Pankey, and Kinnunen (2002) described a similar situation in their research. They supported that the inclusion style of teaching would be most supportive for promoting motor development within the classroom. Teaching style, specific tasks, and environment were all key components in increasing students' motor development.

The researcher feels that the most important information that can be gained from this research is that instruction related to fine motor activities can make a difference. As stated in chapter two, fine motor activities have been slowly excluded from the kindergarten curriculum, and it is time to reevaluate this trend for the betterment of our struggling students.

Threats to Validity

There are several potential factors that threaten the validity of the study. The main threat to validity of this study was a small sample size. There were only 5 students in the control group and 6 students in the experimental group. A small sample size was used because these were the only students who displayed fine motor delays at the beginning of kindergarten. With a small sampling size, it is difficult to obtain statistically significant differences and generalize those differences to the larger population. Fortunately this study was able to show significant differences between the posttests of each group, but the sampling size should still be considered when interpreting the results of this study.

In addition, the control group and experimental group were in different classes with different teachers. Teaching style and environment can influence the motor development of students (Hamilton, Pankey, & Kinnunen, 2002). As in many other studies similar to this one, the use of two classes with different teachers is inevitable. To help limit the impact of this threat to validity, both teachers used the same curriculum and cooperatively planned together. Also the researcher did not share the pretest results or fine motor activities used in the intervention with the control group teacher until after the completion of the study.

The intervention was scheduled to occur 4 times a week for 6 weeks. The researcher encountered many obstacles that altered the scheduled intervention. For example, the researcher and many of the students were excessively absent due to illness causing missed sessions. To accommodate for these missed sessions the researcher included structured fine motor activities during other parts of the school day. The

researcher followed the same guidelines for scaffolding of activities, engagement, and feedback as outlined in the intervention activities. Consequently, the researcher noted that the inclusion of fine motor activities throughout the whole kindergarten day was a benefit to all students in the class, not just the identified students in the study.

The final threat to validity that needs to be addressed is the tool used in the pretest and posttest. Peabody Developmental Motor Scales is a standardized test with specific detailed administration and scoring instructions. While the test provided a standardized norm referenced score, it was limited in the fine motor activities that were scored. With the baseline and ceiling determined by three scores of zero in a row, many participants did not advance to other fine motor activities on which they may have scored well. The activities that were tested and scored for most participants were cutting, building, folding, coloring, gasping and buttoning (Folio & Fewell, 2000).

Relations to Prior Research

Results from this study were consistent with previous studies using additional fine motor activities to increase fine motor development. Rule and Stewart (2002) stated that the use of practical life materials over a 6-month period would improve kindergarteners' fine motor skills. They introduced 50 different sets of activities to the experimental groups and concluded that fine motor activity is important in children's development. Furthermore, their findings revealed that practical, engaging activities focusing on fine motor skill development and practice do significantly improve students' fine motor skills. Their study also concluded that activities like those employed in the study should be included in the classroom on a daily basis.

Through careful observation Poole, Miller, and Church (2006) concluded that “with practice, patience, and support, young children’s motor skills grow by leaps and bounds,” (p. 1). That is exactly what this current research supports. Carefully planned activities that are developmentally appropriate, provide practice of needed skills, and include immediate support and feedback can significantly improve students’ fine motor development.

Suggestions for Further Study

Now that it has been established that the inclusion of structured fine motor activities can positively influence students’ motor skills, the question that still remains is if the improved motor development noted in this study will remain or will decrease after the intervention has stopped. Further research needs to be conducted to see if the results of this study are long lasting or only temporary.

Furthermore, the researcher suggested that the use of fine motor activities throughout the kindergarten day seemed beneficial to all students. Future research is needed to determine if directed fine motor activities included throughout the kindergarten day will be as effective as a separate intervention program geared to improve fine motor skills.

In addition, additional studies like this one should be conducted, but these studies should involve larger sample sizes and longer lengths of time.

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