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Visual-motor integration training and its effects on self-help skills in preschool students with disabilities

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VISUAL-MOTOR INTEGRATION TRAINING AND ITS EFFECTS ON SELF-HELP SKILLS IN PRESCHOOL STUDENTS WITH DISABILITIES

by
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Abstract

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Visual-Motor Integration Training and Its Effects on Self-Help Skills in Preschool Students With Disabilities, 1999, Dr. S. Jay Kuder, Adviser, Special Education Graduate Program.

The purpose of this study was to determine whether structured visual-motor integration training activities aid in the acquisition and refinement of self-help skills in preschool children with disabilities. Research has shown that visual-motor integration training can be beneficial in the remediation of some reading and math difficulties, however, not all researchers agree on the merits of structured training for young children. The experimental group for this study received twenty three visual-motor integration training sessions over the course of thirteen weeks, in addition to the regular visual-motor integration training activities presented in the regular daily curriculum. The control group only received visual-motor integration activities presented in daily classroom lessons. Both groups were pre- and post-tested with the Beery-Buktenica Developmental Test of Visual-Motor Integration, and a customized self-help skills checklist. Post-test data revealed that the experimental group showed gains above the control group on visual-motor abilities, and in several self-help skill areas. The results of this study indicate that

visual-motor integration training may prove to be a beneficial addition to preschool curriculums for students with disabilities. While these young children have not yet entered into academics, solid visual-motor integration abilities may provide a foundation for future academic success.

Mini Abstract

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Visual-Motor Integration Training and Its Effects on Self-Help Skills in Preschool Children With Disabilities, 1999, Dr. S. Jay Kuder, Advisor, Special Education Graduate Program.

This study was designed to determine whether visual-motor integration training aids in the acquisition and refinement of self-help skills in preschool children with disabilities. Results indicated that the experimental group demonstrated gains above the control group in visual-motor abilities and in several self-help skill areas, which implies that visual-motor integration training may be beneficial for teaching self-help skills to preschool children with disabilities.

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Chapter One

Introduction

Visual-motor integration is a type of mind-body coordination that involves motoric responses to visual stimuli. Most people know visual-motor integration as hand-eye coordination, which is necessary for completion of tasks such as playing tennis, hitting a baseball, threading a needle, tracing a line, or putting a puzzle together. However, the significance and importance of visual-motor integration and its relationship to personal independence and academic success frequently goes unnoticed. Reproducing letter combinations, correctly aligning numbers for mathematical calculations, and copying information from the chalkboard are all academic skills which rely heavily on successful visual-motor integration.

As adults, many of us take visual-motor integration skills for granted since our brains have trained our hands and eyes to respond appropriately upon command. Visual and tactile feedback tells our brain whether a given task was performed correctly and accurately.

In young children, however, such hand-eye coordination is just beginning to develop. Training the hands to manipulate various objects in the visual field is a major developmental milestone. Learning to string beads to make a necklace, cutting along a given line, working the catch of a zipper, or learning to print one's name, requires much concentration and visual-motor coordination. Frequently children with developmental delays or disabilities find these types of activities or skills very difficult to master.

Current research suggests that there appears to be a correlation between visual-motor integration and academic success, and that visual-motor coordination is important for learning to read, write, and compute mathematical calculations. Gains in visual-motor functioning tend to carry over to academic areas and also appear to have positive effects on children's reading and math abilities.

Purpose of the Study

The purpose of this research project was to determine if systematically delivered visual-motor integration training exercises aids in the acquisition and refinement of self-help skills such as dressing and undressing, and fastening and unfastening, for preschool children who have disabilities. A series of exercises and activities which reinforce hand-eye coordination and which successively approximates the skills necessary to zip, snap, and button etc., were designed to increase the children's independence and proficiency with these self-help tasks, and should provide a solid visual-motor integration foundation for future academic learning.

Research Question

This study will attempt to answer the following question: Does structured visual-motor integration training influence the acquisition and refinement of self-help skills in pre-school students with disabilities?

The sample of students for this project consisted of ten children currently enrolled in a preschool disabilities class. Each student was randomly assigned to either an experimental or control group. Disabilities of the children included mild to moderate speech and language delays, fine and gross motor delays, neurodevelopmental delays, and mild cerebral palsy. All of the children participating in this study were pre- and post-tested with the Beery-Buktenica Developmental Test of Visual-Motor Integration. All students in the study were also evaluated with a customized self-help skills checklist prepared by the researcher. Self-help skills targeted in this study included dressing and undressing, and fastening and unfastening.

The five students participating in the control group received visual-motor training exercises and activities which were part of the regular daily curriculum. In addition to the regular daily curriculum instruction, the five students in the experimental group also received an extra ten minutes of visual-motor instruction, approximately two times per week, for a total of 23 training sessions. These extra training sessions were administered in the hallway outside the classroom to groups of two to three students at a time.

Significance of the Study

From the data gathered in this study, the researcher hopes to determine whether systematic training of visual-motor integration skills appears to have an effect on the acquisition and refinement of self-help skills in preschool children who have disabilities. Establishing a solid foundation for early visual-motor integration skills should increase the disabled student's likelihood of personal independence and will also provide stable support for future academic success.

Limitations

Limitations of this study included a small sample size, and a disability classification for each student enrolled in this project.

Overview

The following literature review will provide background information on visual-motor integration training and its effects on academic performance and self-help skills. A study which examines visual-motor integration training and its effects on the acquisition and refinement of self-help skills in preschool children with disabilities will also be presented and analyzed.

Chapter Two

Review of the Literature

Visual-motor integration is the motoric response, or the body's output to, information that is received visually. Visual stimuli enters the brain through the sensory input channels where the brain and body coordinate to assume the correct position or prepare for the correct response. Next, the visual input is transferred to the decision making stage which involves memory stores and the sequencing of steps necessary to perform the intended task. Finally the body is directed to carry out the appropriate movements required to complete the given task or action. Visual feedback determines how successfully the task was carried out, and whether any further modifications are required.

Bushnell and Boudreau (1993) suggest that motor functioning may be an important aspect of perceptual ability, and that some motor abilities appear to pave the way for the development of learning abilities, with perception and action being reciprocal and complementary (Lockman, & Thelen, 1993). Bushnell and Boudreau also state that motor ability may impact other areas of growth such as cognitive and perceptual functioning, and mental development (Bushnell & Boudreau, 1993).

The majority of available research focused on visual-motor integration functioning and its impact on academic performance and success for school-aged children, with only small amounts of the literature addressing visual-motor integration and self-help skills for preschool children who have disabilities. Based on the evidence presented in the literature, one could postulate that visual-motor integration plays an important role in the acquisition and refinement of skills such as buttoning and unbuttoning, zipping and unzipping, lacing and unlacing, snapping and unsnapping etc., as necessary for independent dressing and undressing.

When first learning many new skills, motor output frequently needs to be coupled with visual input to perform the task successfully. For example, zipping requires looking at the zipper catch and placing the foot of the zipper into the catch. Snapping requires the visual and physical alignment of the snaps so they fit together properly. Initially, skills may need to be sequentially practiced in order for the tasks to become automatic and fluid. Many children appear to benefit from experiencing the entire sequence of steps involved in a task, rather than learning only one isolated step at a time (McKelvey, 1992).

Preschool children who have disabilities frequently have difficulty integrating visual-perceptual and visual-motor tasks, and often exhibit deficits or delays in visual-motor functioning, which makes the acquisition of these seemingly simple tasks much more challenging. Perceptual difficulties in dressing, such as not being able to find the front or back of clothing, placing the shoes on the wrong feet, confusing the left and right sides of the body, and not knowing which arm or leg goes in which hole significantly impacts independent functioning with self-help skills. Active participation in a child's own self care has a number of benefits, including maintaining and improving sensorimotor, cognitive and psychosocial skills (Case-Smith, J., et al., 1996, p. 462). Independent functioning in self-help skills is an important long term goal for many individuals with disabilities.

Developmental delays and/or speech and language disorders, and the degree of the disability(ies) can also significantly impact a child's motor performance. Disabled children often experience difficulty with motor coordination, attention span, sequencing of tasks, memory, and the ability to generalize skills across environments. To accomplish many self-help skills such as dressing and undressing, occasionally the hands need to work independently, and at other times they need to work together in bilateral coordination. Poorly graded movements such as reaching too far or not far enough for an object, poor timing of muscle contractions which move the arms and hands too slowly or quickly, and limitations imposed by Parkinson's Disease, Multiple Sclerosis, and other central nervous system disabilities, play key roles in visual-motor integration acquisition and fluency.

Early systematic and sequential training in visual-perceptual and visual-motor integration activities for preschool children who have disabilities should increase their opportunities for future personal and academic success. Attainment of self-help, or personal care skills increases an individual's confidence and has positive effects on selfconcept. Instruction utilizing multiple modalities not only increases attention to the task, but also allows the stronger learning channels to train the weaker ones. Newly acquired skills need to be practiced sufficiently enough so that they become automatic and routine.

Children with disabilities often have difficulty learning to make generalizations from one learning situation to another. Sufficient practice and repetition not only reinforces the new skills, but also increases the likelihood that the new skills will generalize to other areas of learning. Providing preschool students who have disabilities with repeated visual-motor integration training, and teaching how the newly learned skills apply to other situations, should increase the children's opportunities for future success both inside the classroom and in the outside world.

From the 1920s to 1940s, motor development specialists Arnold Gessell, Myrtle McGraw, and Mary Shirley believed that motor development occurred in a sequential and stepwise manner and was the cornerstone to future psychological, cognitive and social growth (Lockman, Thelen, 1993). However, researchers now understand that motor development occurs in a gradual sequence in which new skills initially appear in rudimentary forms and are performed in highly structured contexts. Over time, the newly acquired motor skills are performed more easily and in a wider variety of situations.

As a child develops, he or she first gains control of gross motor hand movements and coordination before fine motor skills and hand-eye coordination can be established.

Initially children learn to match the movements of their eyes with the movements of their hands, and then eventually the eyes are used to guide hand movements. Crawling is the first developmental milestone involving coordination of the right and left side of the body and requiring that the eyes focus together at an arm's length distance.

Ayres (1958) found that as children mature, they first learn to coordinate visual skills with hand skills such as reaching to grasp an object. Later they learn to combine hand-eye coordination with visual perceptual skills such as tracing, or cutting along a line. As children mature, they begin to efficiently combine hand-eye coordination with visual-perceptual skills. Refinement of this motor development, along with cognitive and social development allows a child to engage in more challenging activities (Case-Smith, J., et al., 1996).

During the 1960s, visual-motor integration abilities were thought to be similar to muscle action, and that weaknesses with visual-motor integration could be remedied simply by exercising or practicing skills that required hand-eye coordination. For many years researchers believed that the brain was the command center which dictated and directed all of the body's responses, and they also believed that strengthening visual-motor integration abilities in one area would automatically transfer to other areas (Beery, 1997).

Within the last decade, however, there has been a resurgence of interest in motor development, and child development specialists currently view motor development as a guideline for maturation and change. Research by Esther Thelen (1995) indicates that motor milestones appear to be genetically driven and are the result of growth within the brain and central nervous system, with experience acting as a secondary factor. Current research tends to suggest that the body responds to input in a holistic fashion, because the brain cannot account for every individual stimulus received. The brain, joints, muscles and neurons of the body appear to work together to bring about the desired or appropriate motoric response. Typically visual-motor integration abilities are ascribed to the right hemisphere of the brain, and the integration process is believed to occur through several channels and areas depending on the required task.

Research by Jean Harber (1979) suggests that there is a moderate correlation between perceptual-motor coordination and reading ability, and that the magnitude of this relationship depends on or varies according to one's developmental level. She also states that visual perception, which refers to how objects are seen, discriminated or perceived, and visual-motor performance appear to be autonomous functions. Her research with 104 lower middle-class second grade students showed that there is a greater relationship between perceptual-motor ability and reading than there is between visual perception and reading. Similarly, Dikowski (1994) determined through his work with children who demonstrated either visual-motor difficulties and/or visual deficiencies, that a child may have good visual coordination and motor coordination separately, but may not be able to successfully integrate the two functions. A lack of complete visual and motor development in early childhood can significantly impede future academic success.

In her work with 60 Israeli children, (30 children exhibited balance and gross motor coordination difficulties as certified by an occupational therapist), ages 4 years 10 months, to 7 years 1 month, Parush (1998) determined that in normally developing children, visual-motor integration and perceptual abilities appeared to function through separate channels in the brain, and developed independently of one another. However, visual-motor integration and perception appeared to be related abilities in children who exhibited balance and coordination problems. Parush believes that in this latter group of children, the visual stimulus was perceived incorrectly, thus producing a flawed motoric response, which further suggests a relationship between the visual-motor and visual-perceptual channels of integration (Parush, 1998).

Through her research with 54 learning disabled children in grades two through seven, Mary Aiello-Cloutier (1993) suggests that there appears to be a relationship between scores obtained on the Beery-Buktenica Developmental Test of Visual-Motor Integration and written variables such as handwriting, motivation to write and the overall quality of writing. The Beery test is designed to assess the extent to which individuals can integrate their visual and motor abilities, and was normed on 2,614 children ages 3-18. Her findings suggest that there is a positive relationship between scores obtained on the Beery test and abilities related to written expression. Similarly, Dikowski (1994) reported that visual-motor deficits affect the mechanical aspects of spelling, handwriting, math calculations and written expression.

Research by Marjorie Corso (1997) also reports that if a child cannot visually follow a ball which has been rolled or thrown, then he or she probably will have difficulty tracking words and letters on a piece of paper or chalkboard. Corso conducted a qualitative longitudinal study involving 28 children who were not working up to expected grade level, but did not qualify for special educational services. Her results indicated that there appeared to be a relationship between mastery of locomotor, non-locomotor, manipulative abilities, and achievement in academic learning. She also stated that mixed hand-eye dominance can affect reading comprehension. Mixed hand-eye dominance means that a child may be right hand dominant for activities such as writing or using scissors, but the left eye may be more dominant visually. Children who experience mixed hand-eye dominance usually can read fluently, but tend to have difficulty with comprehension because either both sides or neither side of the brain responds appropriately upon command.

Dikowski suggests that visual-motor skills appear to respond to remediation, and that gains in this area have been found to have positive effects on reading performance. Work with children referred to his clinic for visual-motor and/or visual deficiencies demonstrated improvements in visual-motor integration abilities and handwriting skills. A variety of computer training activities and visual-tactile activities were taught over a seven week program, resulting in eight out of ten children showing improvements in visual-motor integration abilities, and five out of ten showing improvements in handwriting skills, as evidenced through pre- and post-test scores on the Beery-Buktenica Developmental Test of Visual-Motor Integration, formal handwriting inventories, and parent handwriting inventories. Dikowski also states that based on his literature review, an increase in visual-motor skills appears to have a positive effect on reading performance, and visual-motor capabilities can be early predictors of intelligence and academic success. Communication disordered and neurologically impaired children benefit from visual-motor training by using the strong sensory channels to train the weaker ones.

A study by Connie Crawford (1995) on the effects of shadowing to improve visual-motor skills in kindergarten children demonstrated that shadowing tasks coupled with additional perceptual-motor activities increased the students' body awareness, fine motor coordination, gross motor skills, visual-motor integration and depth perception.

The 59 children in the study were randomly assigned to one of three groups. One group received ten minutes of shadowing activities, followed by 30 minutes of perceptual-motor activities. The next group received 30 minutes of perceptual-motor activities, but did not participate in any shadowing activities. The third group was the control group and did not receive any shadowing or perceptual-motor activities.

Shadowing activities included shape tag, in which children had to match shapes which were projected on the wall, balloons were guided through mazes projected on the wall with an overhead projector, and body tracing activities, in which the children's body outlines were traced on the wall, and then other children had to fit their bodies into the tracings by matching the various body positions. In all three groups, females scored higher than males, and the group which received shadowing and perceptual-motor instruction out performed the other participants in all areas of assessment.

In his manual on activities to improve perceptual-motor skills, Horvat suggests that children with perceptual difficulties can benefit from activities that are well organized, address the child's preferred learning style, and use developmentally appropriate visual, auditory, kinesthetic and tactile strategies. He states that skills need to be developmentally sequenced and practiced sufficiently enough to become automatic and fluid. The systematic sequence of activities and tasks needs to eventually lead to the desired end product of writing or reading, etc.

While there is much research which indicates that visual-motor integration training programs are beneficial in increasing academic performance in areas such as reading, handwriting and math, there is a significant amount of research, both old and new that contradicts the benefits of visual-motor integration training. Research by Kavale and Mattson (1983) who reviewed 180 studies addressing the effectiveness of visual-motor training revealed that visual-motor integration training is not an effective intervention technique for remediation of academic difficulties. This study reveals that the perceptual-motor programs which were evaluated produced minimal results such as benefits of only one tenth of a standard deviation worth of progress. Participants in the studies only appeared to do better than 54% of the participants who did not receive any visual-motor training.

Similarly, Corrie and Barratt-Pugh (1997) suggest that there is little research to support the effectiveness of perceptual-motor training programs for children who have disabilities and for normally developing children. They argue that play is a natural medium for learning and acquisition of new information in young children, and that available or commercial visual-motor integration training programs frequently consist of a lock-step type of format which is developmentally inappropriate. Many of the tasks are teacher directed, fail to recognize the children as individuals, and provide little opportunity for discovery and exploration. During play activities, children explore, experiment, and creatively solve problems. Free and guided play offers opportunities for children to interact in meaningful ways, where rigid and strictly sequenced perceptual-motor integration programs decrease or eliminate natural learning experiences. Work on perceptual-motor integration and its benefits by Ayres, a pioneer in early perceptual-motor research in the 1960s, formed the basis for many perceptual-motor programs. Corrie and Barratt-Pugh, however, discovered that Ayres' conclusions were faulty and were not based on sound research methods. Many of his results could not be reproduced.

While Corrie and Barratt-Pugh do not dispute that perceptual-motor training programs have their merits and can be beneficial for some children, they argue that the lock-step method in which much of the training activities are presented are not congruent with developmentally appropriate educational practices. Play activities are a much more natural way to facilitate visual-motor integration in young children.

Wright and DeMers' research with 55 boys and 31 girls ages six to eleven, suggests that impaired visual-motor integration skills appear to be correlated, but should not be considered causal factors in learning disabilities, and that visual-motor abilities may offer little information other than general ability levels (Wright, & DeMers, 1978).

The focus of this research project was to determine whether visual-motor integration training has an effect on the acquisition and refinement of dressing and undressing skills, such as snapping, buttoning, and zipping etc., in preschool children who have disabilities. Although the research tends to emphasize both positive and negative aspects of structured visual-motor integration training, the researcher still hopes to find that this type of instruction may be a viable educational option for many young children with disabilities.

Chapter Three

Design of the Study

This experimental pre-test post-test control group design research project was conducted in a self-contained preschool disabilities class located in a suburban public elementary school. The ten children involved in the study were between the ages of four and five years old, and with disabilities ranging from speech and language delays, to mild involvement with cerebral palsy (see Table 1). Five students were randomly assigned to a control group, with the remaining five students assigned to an experimental group. Informed consent was obtained for all participants by having parents sign a permission slip allowing their child to participate in the study.

The independent variable for this study was the visual-motor integration training activities, and the dependent variable was each child's post-test score on the Beery-Buktenica Test of Visual-Motor Integration and performance on the self-help skills checklist.

Table 1
Disabilities of Children Involved in the Study

Experimental Group			Control Group		
Pupil	**Disability**	**Services**	**Pupil**	**Disability**	**Services**
1	Behavioral Concerns, Speech and Language Delays	Speech	6	Mild Cerebral Palsy, Speech and Language Delays	Speech, PT, OT
2	Speech and Language Delays, Fine and Gross Motor Delays	Speech, PT, OT	7	Speech and Language Delays, Fine Motor Delays	Speech, OT
3	Speech and Language Delays	Speech	8	Speech and Language Delays	Speech
4	Speech and Language Delays, Fine and Gross Motor Delays	Speech, PT, OT	9	Speech and Language Delays, Fine Motor Delays, Behavioral Concerns	Speech, OT
5	Speech and Language Delays	Speech	10	Speech and Language Delays, Neurodevelop-mental Delays	Speech, PT, OT

Services, as stated in Table 1, refer to specific therapy services provided for each student:

Speech = Speech and language therapy
PT = Physical therapy
OT = Occupational therapy

Instrumentation

All children participating in the study were individually pre- and post-tested for visual-motor integration abilities with the Beery-Buktenica Developmental Test of Visual-Motor Integration. Self-help skills were assessed through a teacher constructed self-help skills checklist. The Beery-Buktenica Developmental Test of Visual-Motor Integration requires a child to copy a series of 18 geometric forms and designs. The test can be administered in approximately 10 to 15 minutes to an individual or group, and is considered to be culture free because almost all children will be, or have been, exposed to the geometric designs presented in the test booklet. The test was most recently normed in 1989 with a national sample of 2,734 children, and has been normed in other countries as well. The overall reliability of the test is 0.92, with a split-half correlation of 0.88. Predictive validity is 0.80-0.90 and can be a valuable tool for predicting future academic ability when used with a combination of other assessment methods. Validity correlates with chronological age because visual spatial skills in children tend to shift to more language based skills as they mature.

The self-help skills checklist consisted of a total of 22 skills necessary for dressing and undressing. This particular checklist was customized by the researcher to meet the needs of the sample population, and to stay within the parameters of this study.

Design of the Training Program

Children in the control group received visual-motor integration training activities through the regular daily classroom curriculum. These activities included but were not limited to using scissors to cut out shapes and designs drawn on paper, tracing with templates, working puzzles, and constructing geometric designs with pegs and rubber bands on geoboards and pegboards.

Students assigned to the experimental group received visual-motor integration activities which were part of the regular daily preschool curriculum, plus additional visual-motor training integration sessions approximately two days per week. Training activities included but were not limited to, squeezing clothespins to pick up small objects placed in containers of rice, using magnetic wands to guide magnetic chips through mazes, utilization of pegs, pegboards, and popsicle sticks to reproduce visually presented geometric patterns, stringing beads, lacing, placing marshmallows on toothpicks, and cutting and tracing a variety of lines and patterns. See Appendix A for sample activities.

Each additional training session for the experimental group was approximately 10 minutes long, and consisted of small groups of two to three students at a time. A total of 23 additional training sessions were administered over the course of 13 school weeks. The training sessions were stretched over this length of time in order to account for school holidays, classroom disruptions and unforeseen circumstances. When possible, training sessions were administered in the hallway to eliminate classroom distractions, however, on several occasions, training sessions took place within the classroom.

Data Collection and Analysis

Following the scheduled intervention period, students in the experimental and control groups were post-tested individually with the Beery-Buktenica Developmental Test of Visual-Motor Integration, and the same teacher constructed self-help skills checklist. Pre-and post-test data were calculated and analyzed to determine if the visual-motor integration training sessions appeared to have an affect on the acquisition and refinement of self-help skills.

Chapter Four

Presentation and Analysis of the Data

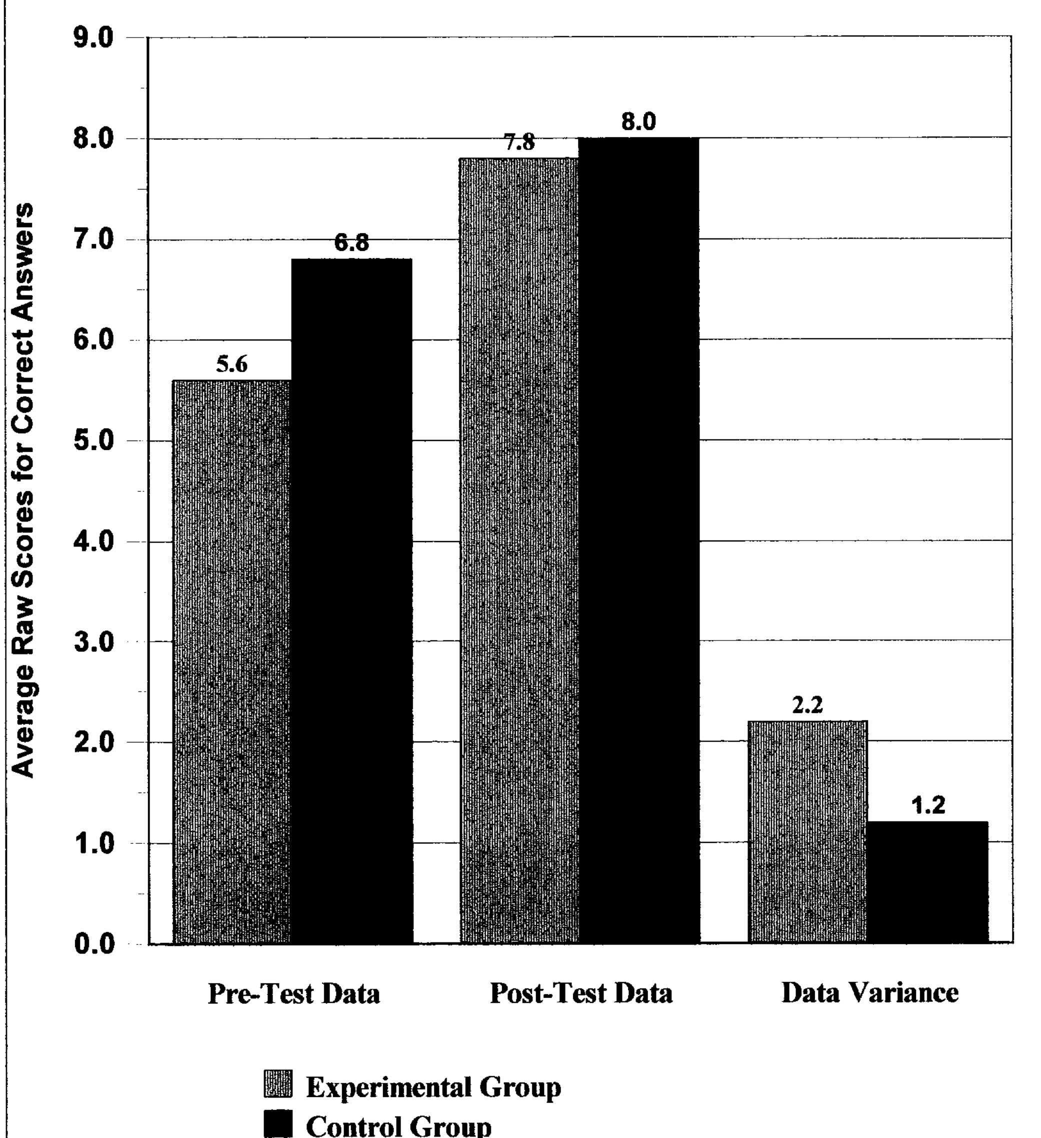
The purpose of this research project was to determine whether visual-motor integration training has an effect on the acquisition and refinement of self-help skills in preschool children with disabilities. Ten children from the same preschool disabilities class were involved in this study. Five of the children were randomly assigned to an experimental group, while the other five children were randomly assigned to a control group. Visual-motor integration training activities for the experimental group took place twice per week, with small groups of two to three children over a 13 week time span. A total of 23 small group training sessions were completed.

Results

Pre-test data from the Beery-Buktenica Developmental Test of Visual-Motor Integration indicated that the experimental group obtained a mean pre- test raw score of 5.6 geometric designs copied correctly, and a post-test raw score of 7.8 designs correct. The control group obtained a mean pre- test raw score of 6.8 geometric designs copied correctly, and a mean post-test raw score of 8.0. This data reveals a gain of 2.2 raw score points for the experimental group, and 1.2 points for the control group. Refer to Figure 1.

Figure 1

Average Pre- & Post-Test Raw Scores for the Beery-Buktenica Developmental Test of Visual-Motor Integration



The mean pre-test standard score on the Beery-Buktenica Developmental Test of Visual-Motor Integration for the experimental group was 81.8 and 89.6 for the control group. Mean post-test standard scores were 87.6 for the experimental group and 90.4 for the control group. The experimental group increased their average standard score by 5.8 points, while the control group increased their average standard score by 0.8 points. Refer to Figure 2.

Pre- and post-test data from the self-help skills checklist was analyzed to determine how many additional independent skills the children achieved or mastered and how many fewer prompts and/or gestures were needed for task completion following the intervention period. Results indicated that in the area of dressing and undressing, the experimental group increased their number of independently performed skills by 13 and required 28 fewer verbal and physical prompts or refusals following the intervention period. The control group mastered 16 additional independent dressing and undressing skills and required 26 fewer gestures and verbal and physical prompts for task completion. Refer to Table 2.

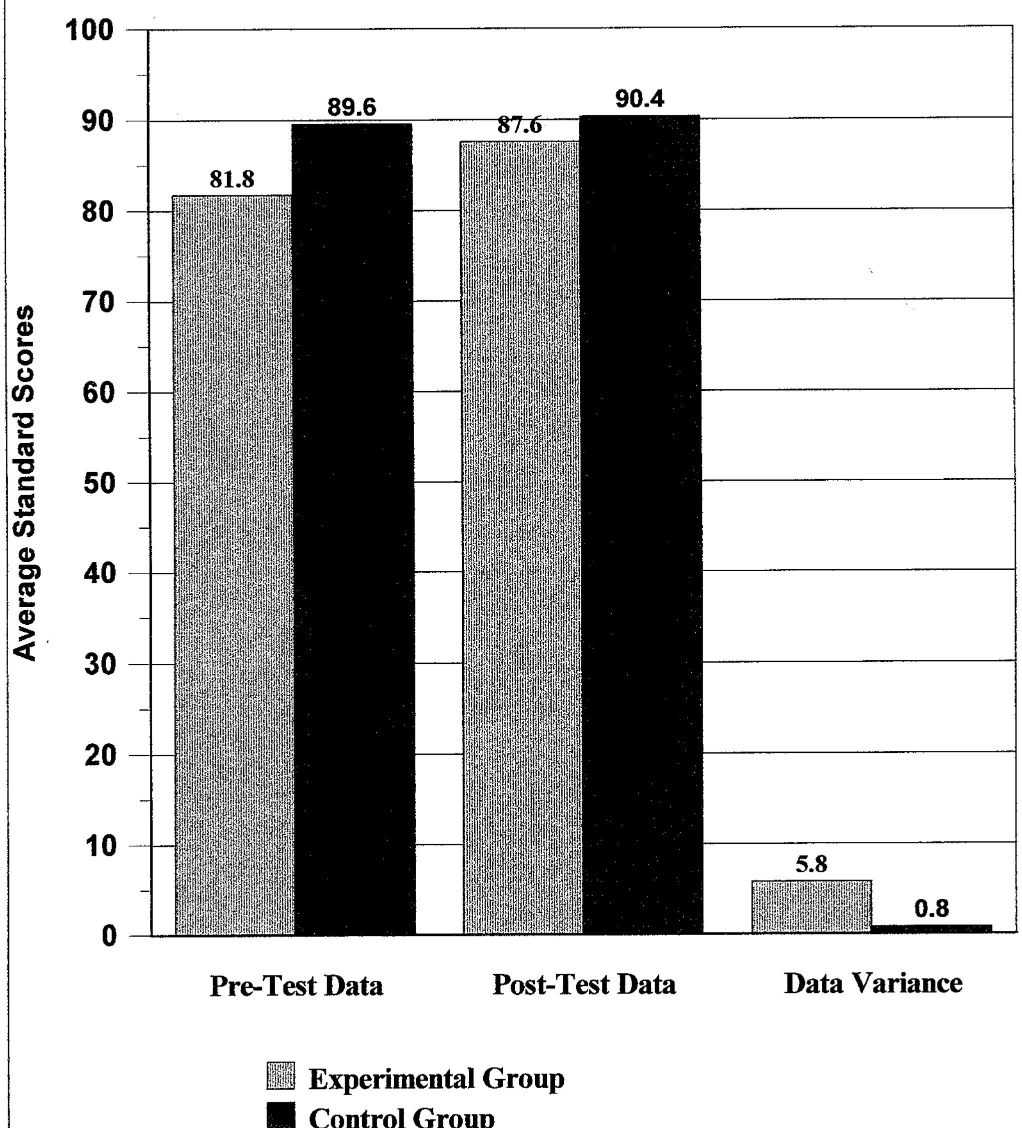
Table 2
Dressing and Undressing Skills

	Pre-Test *		**Post-Test ***		**Variance ***	
Responses	**Group 1**	**Group 2**	**Group 1**	**Group 2**	**Group 1**	**Group 2**
Independent	24	23	37	39	13	16
Gesture	0	3	0	0	0	-3
Refusal	2	0	0	0	-2	0
Verbal Prompt	22	21	12	11	-10	-10
Physical Prompt	19	20	5	7	-14	-13

*** Group 1 - Experimental Group   Group 2 - Control Group**

Figure 2

Average Pre- & Post-Test Standard Scores for the Beery-Buktenica Developmental Test of Visual-Motor Integration



In the area of unfastening, both groups were comparable in that the experimental group increased the number of independent skills attained by two, and decreased the need for gestures and verbal and physical prompts by two. The control group increased their independent skills by one and reduced their verbal and physical prompts and gestures by two. Refer to Table 3.

Table 3
Unfastening Skills

	Pre-Test *		**Post-Test ***		**Variance ***	
Responses	**Group 1**	**Group 2**	**Group 1**	**Group 2**	**Group 1**	**Group 2**
Independent	23	24	25	25	2	1
Gesture	0	0	0	0	0	0
Refusal	0	0	0	0	0	0
Verbal Prompt	2	1	0	0	-2	-1
Physical Prompt	0	1	0	0	0	-1

*** Group 1 - Experimental Group   Group 2 - Control Group**

The area of fastening is where the performance of the groups appeared to differ the most. The experimental group increased their number of independent skills by ten and reduced the need for gestures and verbal and physical prompts by 28, whereas the control group increased their independent skills by two, decreased their verbal and physical prompts by 19, but increased their gestures by one. Refer to Table 4.

Table 4

Fastening Skills

	Pre-Test *		Post-Test *		Variance *	
Responses	**Group 1**	**Group 2**	**Group 1**	**Group 2**	**Group 1**	**Group 2**
Independent	24	25	34	27	10	2
Gesture	0	2	0	3	0	1
Refusal	0	0	0	0	0	0
Verbal Prompt	31	27	10	16	-21	-11
Physical Prompt	16	20	9	12	-7	-8

*** Group 1 - Experimental Group   Group 2 - Control Group**

Summary

From the data presented, the experimental and control groups appeared to be fairly equal prior to the visual-motor training exercises. Following the intervention period, both groups still were fairly equal in skill level for dressing and undressing, and unfastening, however, post-test data revealed that the experimental group attained greater independence with their fastening skills, and that their mean post-test score on the Beery-Buktenica Developmental Test of Visual-Motor Integration was higher than their control group counterparts. Results from this study indicate that the experimental group showed positive growth in their self-help abilities following structured visual-motor integration training.

Chapter Five

Summary and Conclusions

This study examined the effects of visual-motor integration training on the acquisition and refinement of self-help skills in preschool children who have disabilities such as mild to moderate speech and language delays, neurodevelopmental delays, fine and gross motor delays, and mild involvement with cerebral palsy. The experimental group in this study received 23 structured visual-motor training sessions above and beyond the regular visual-motor integration activities routinely presented in the daily curriculum.

Previous research both supports and refutes the merits of visual-motor integration training for young children, especially those with disabilities. Independence in skills associated with dressing and undressing are important influences on a young child's sense of self-esteem and autonomy.

Data obtained in this study appeared to support the hypothesis that visual-motor integration training aids in the acquisition and refinement of self-help skills in preschool students with disabilities. At the beginning of this study, the experimental and control groups obtained similar pre-test scores on the Beery-Buktenica Developmental Test of Visual-Motor Integration, and on the self-help skills checklist. Following the 23 session intervention period which included structured small group visual-motor integration training activities, the experimental group showed greater independence in the area of fastening, and had a higher mean post-test score on the Beery-Buktenica Developmental Test of Visual-Motor Integration. According to the data obtained, visual-motor integration training does appear to be beneficial in the acquisition and refinement of self-help skills in preschool children with disabilities.

Discussion

The findings of this project agree with Dikowski's (1994) suggestion that visual-motor integration skills appear to respond to remediation. The visual-motor integration training activities presented to the experimental group were well organized, addressed the children's preferred learning styles, utilized developmentally appropriate instructional strategies, and were designed to meet the needs of the students enrolled in the study.

Limitations and intervening variables which may have influenced the outcome of this study include the sample and sample size, classroom disruptions, history and maturation. Due to the population targeted for this project, the researcher was limited to only ten children, and the sample included only children with disabilities. To further validate the results presented here, repeating this research project with a larger sample of preschool students with and without disabilities, might yield greater insight as to additional benefits of visual-motor integration training for young children.

Classroom disruptions and the short window of daily time in which the training sessions could be conducted significantly impacted the number of training sessions the researcher was able to administer. Several training sessions were missed due to student behavior difficulties and unanticipated classroom disruptions which required prolonged teacher intervention.

History, which involves the length of time the study was carried out also may have impacted research results. Originally the intervention period was to have been completed in ten weeks, however, the project had to be extended to 13 weeks in order to make sure enough training sessions had been administered.

Research results may also have been influenced by natural maturation. The extended length of this project, the children's natural growth and separate training by physical and occupational therapists may have also contributed to the positive results obtained in this study.

In order to control for the intervening variables and the limitations encountered in this research project, future researchers may elect to have an entire class serve as either an experimental or control group. This situation would allow the teacher or researcher to incorporate the additional training activities into the daily curriculum, and would provide greater flexibility in delivering training sessions. Designing a research project which involves an entire class as a single group may provide longer and more in depth instructional sessions, and may decrease the opportunities for potential disruptions. Administration of the activities with an entire class or fully integrating the training sessions into the daily curriculum may be more beneficial than the pull-out training sessions delivered in this project.

Conclusions

Results of this research project indicated that visual-motor integration training appears to be beneficial in the acquisition and refinement of self-help skills in preschool children with disabilities. While some researchers do not believe structured training activities are appropriate for young children, this project demonstrated that in some scenarios structured training can be beneficial, especially when visual-motor integration training exercises are incorporated into age appropriate play activities. Frequently children with disabilities require more teacher direction and guidance in learning new skills or tasks. This project provided the close teacher direction and guidance necessary to improve visual-motor integration skills, while still allowing the students opportunities for individual discoveries and developmentally appropriate play exploration.

The visual-motor integration gains the children experienced with this project should provide a solid foundation for the future acquisition of additional skills in other subject areas. Currently it is too early to determine the long-term effects of the training sessions presented in this study, however, one must consider any and all instructional techniques and options which may improve a child's opportunities for success.

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Appendix A

SELF-HELP SKILLS CHECKLIST

Self-Help Skills Checklist

Key

I = Independent
G = Gestural Prompt
R = Refused
V = Verbal Prompt
P = Physical Prompt
_ = Error

Dressing & Undressing	**Baseline**	**Re-Evaluation**	**Comments**
1. Will remove socks			
2. Will remove shoes			
3. Will remove coat			
4. Will remove pull on garments			
5. Will put on shoes (may be on wrong feet)			
6. Will put on coat			
7. Will put on socks			
8. Will pull on pull over garment			
9. Will know which shoe goes on which foot			

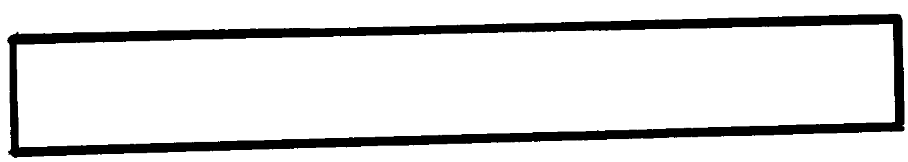
Self-Help Skills Checklist

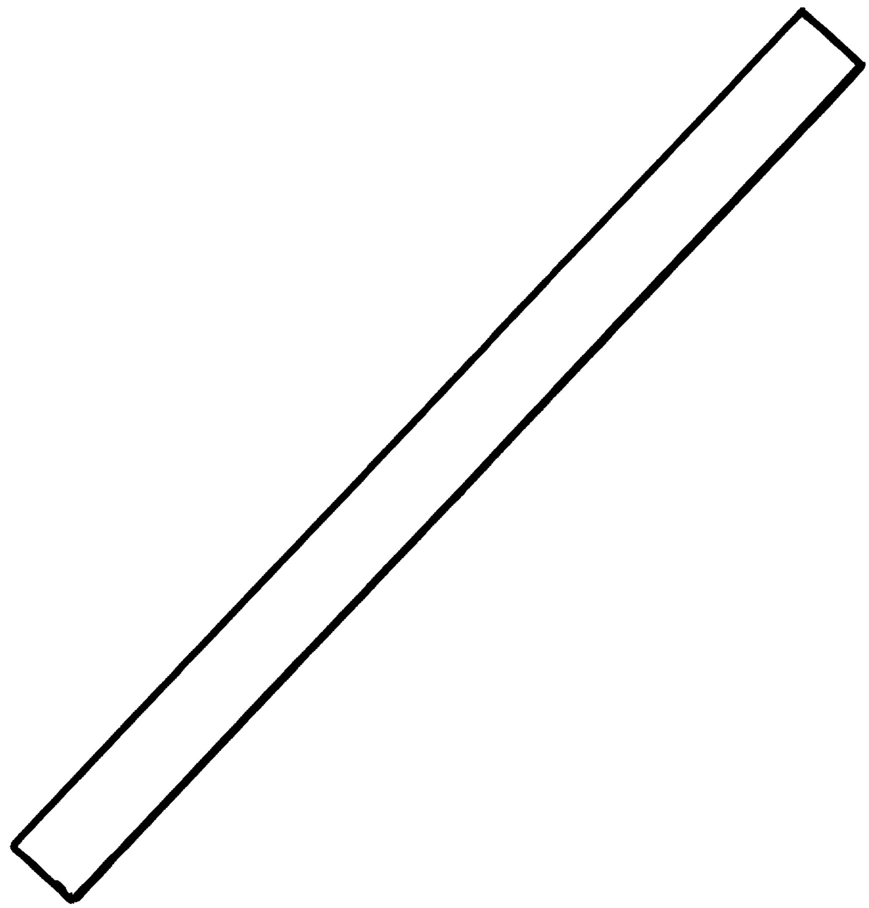
Unfastening:	Baseline	Re-Evaluation	Comments
1. Will unzip non-separating zipper			
2. Will unbutton front buttons			
3. Will untie a bow			
4. Will unsnap front snaps			
5. Will unzip front separating zipper			

Fastening:	Baseline	Re-Evaluation	Comments
1. Will button large front buttons			
2. Will snap front snaps			
3. Will zip front non- separating zipper			
4. Will attempt to lace shoes (may be incorrect)			
5. Will button small front buttons			
6. Will buckle belt or shoes			
7. Will lace shoes			
8. Will zip front separating zipper			

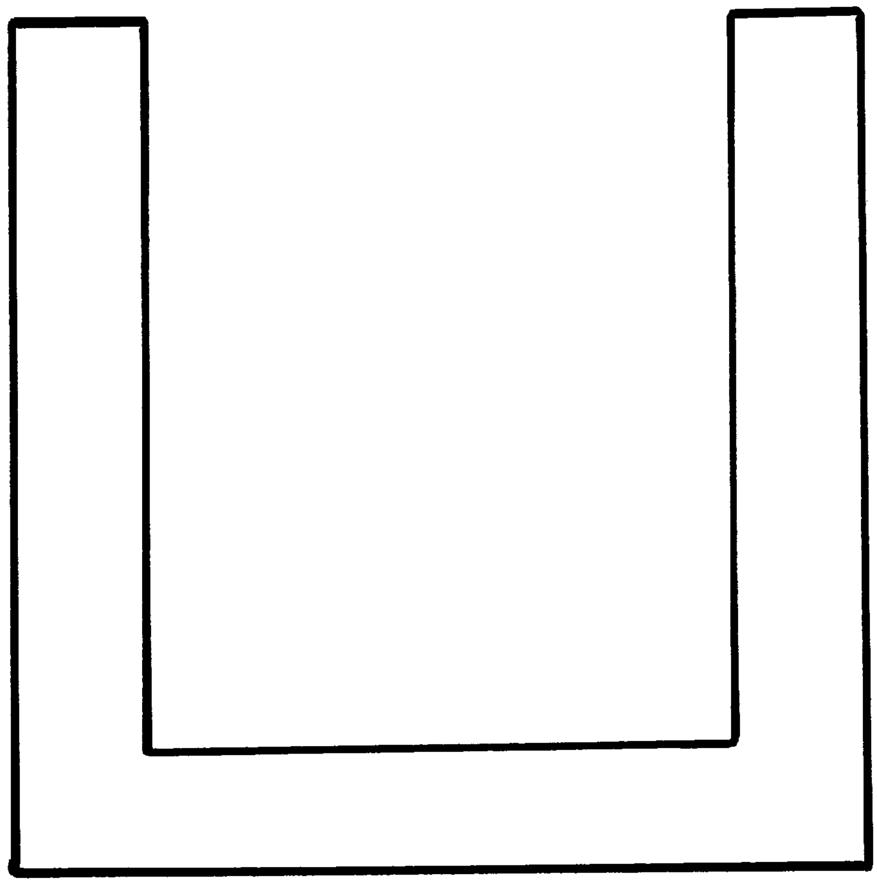
Appendix B

SAMPLE GEOMETRIC DESIGNS, MAZES, AND ACTIVITIES





L



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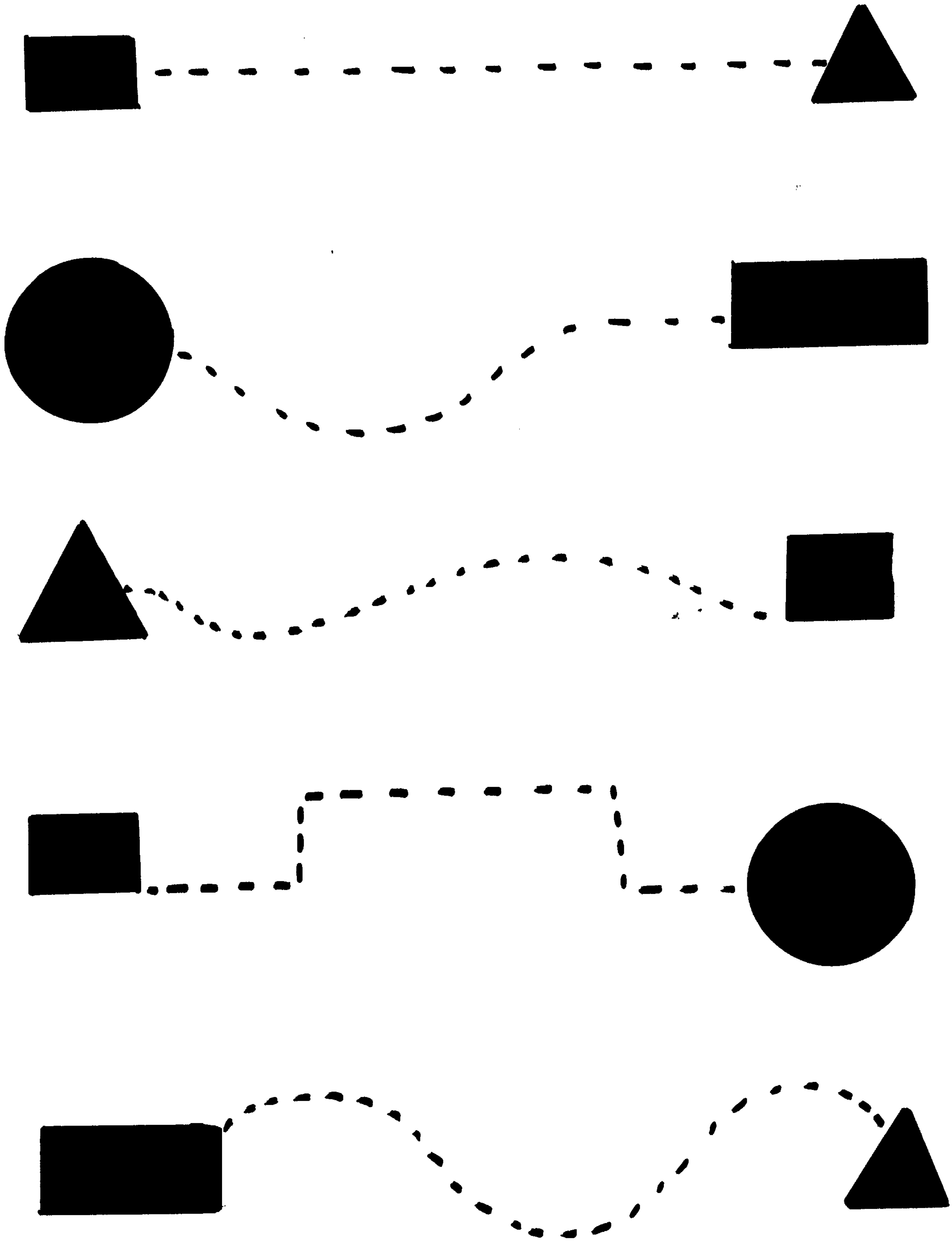
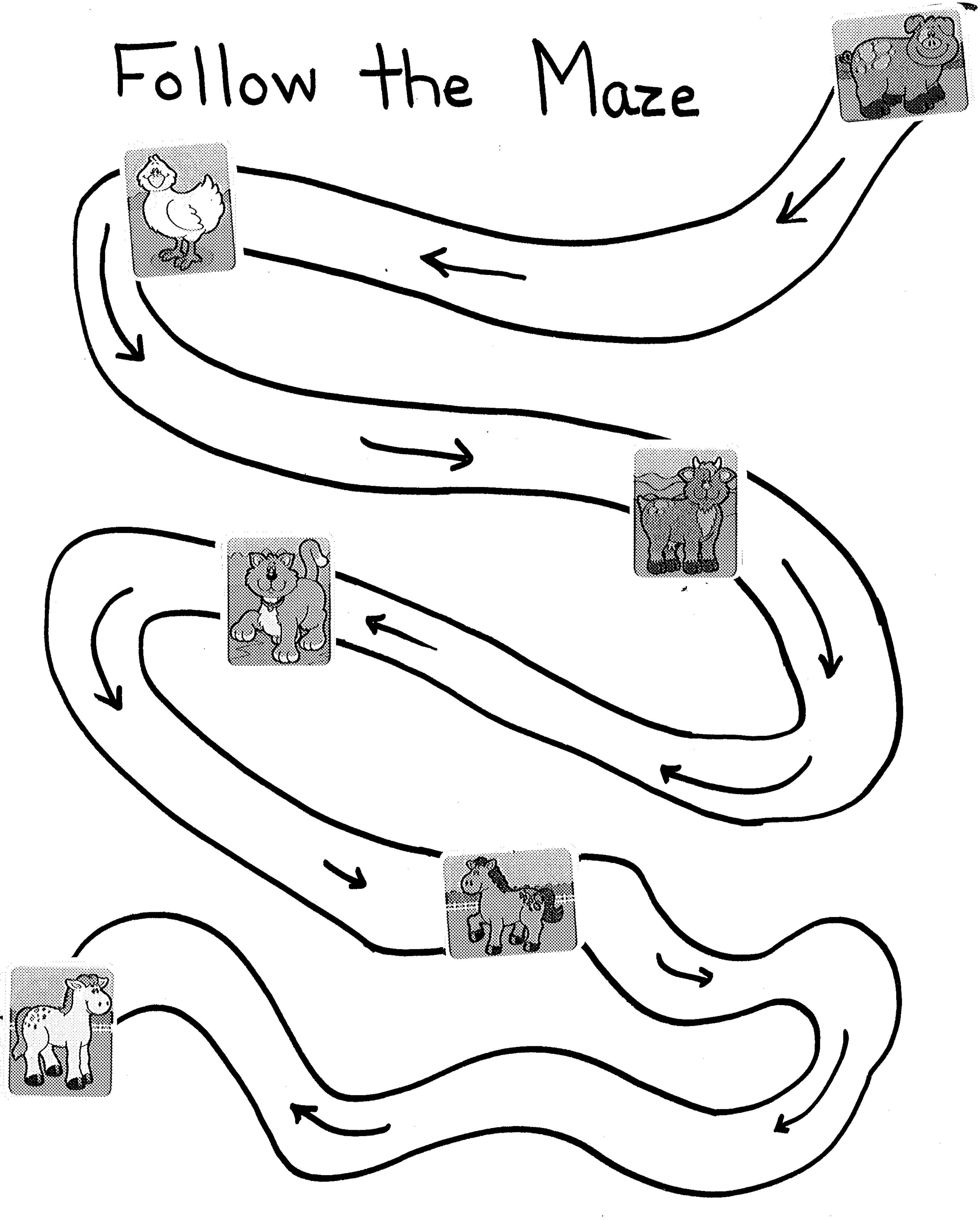


Follow the Maze



Follow the Maze