To the Graduate Council:

I am submitting herewith a dissertation written by Marsha Renae' Wallace entitled "The Effects of Faded Manual/Verbal Guidance, Faded Visual/Verbal Guidance, and No Guidance on Learning and Retention of a Two-Hand Coordination Task by Children with Mental Disabilities." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Human Performance and Sport Studies.

Wendell P. Liemohn, Major Professor

We have read this dissertation
and recommend its acceptance.

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THE EFFECTS OF FADED MANUAL/VERBAL GUIDANCE, FADED VISUAL/VERBAL GUIDANCE, AND NO GUIDANCE ON LEARNING AND RETENTION OF A TWO-HAND COORDINATION TASK BY CHILDREN WITH MENTAL DISABILITIES

A Dissertation

Presented for the

Doctor of Education

Degree

The University of Tennessee, Knoxville

Marsha Renae' Wallace

December, 1993

DEDICATION

To my husband, Wayne, who put my dream first, and whose continuing faith and support I cherish.

To my wonderful daughter, Brittney, who sacrificed so much of our time together.

And to my parents, Joel and Mary Burnum, who taught me the self-discipline to make all things possible.

ACKNOWLEDGEMENTS

Through the course of my dissertation, many individuals have helped me generously. In particular I would like to express my gratitude to my faculty committee members, who include:

(a) Dr. Wendell Liemohn, whose knowledge and professional integrity have taught me invaluable lessons, and whose countless readings and advice are deeply appreciated.

(b) Dr. Craig Wrisberg, who generated the spark and fired my interest in this subject.

(c) Dr. Susan Benner, whose knowledge in assessment and early childhood development was most helpful.

(d) Dr. Patricia Beitel, whose support and willingness to help were constant and always appreciated.

The cooperation of Dr. Gene Hays and the University of Tennessee Recreation Day Camp for their assistance in providing subjects for my initial study is recognized.

My appreciation is also extended to Carol Smith, Supervisor of Special Education, as well as the teachers, principals, and parents in St. Tammany Parish, Louisiana, who opened their doors and allowed me to work with their children.

A special acknowledgement is extended to the head of Southeastern Louisiana University's Department of

Kinesiology and Health Studies, Dr. Betty Baker, for her understanding and support this past year.

Thanks and much appreciation is also given to Glenda Dills, secretary in the Department of Human Performance and Sport Studies, University of Tennessee, who gave of her knowledge and patience many, many times to enlighten me on the mysteries of the computer.

ABSTRACT

Manual guidance is often an accepted method of teaching psychomotor skills to learners with mental disabilities. However, research and opinions present a conflicting and confusing picture on the efficacy and use of this methodology. The purpose of this research was to study the efficacy of manual guidance as a teaching methodology with children with mental disabilities. This research consisted of a two-phase pilot study to develop the training protocol and the primary study; for both studies the task was a simple rhythmic tapping task executed in time with an auditory stimulus.

In Phase 1 of the pilot study 11 subjects who were non-disabled attempted the task with the stimulus presented at 500, 750, and 1000 ms intervals. An analysis of the results suggested that the Hz level of the stimulus presentation did not have a significant effect on the tapping performance of the subjects. Therefore, the 750 ms intertap interval was chosen for subsequent testing because it had been used in prior research with this equipment.

In Phase 2 eight of the original subjects were assigned to either a treatment group or a control group. The treatment group was taught the rhythmic tapping task using a manual guidance training program; the control group practiced the task without additional instruction. The

feedback from the subjects, as well as the practice in administering the training, were used in the development of the training protocol for the primary study.

In the primary study three teaching methodologies were compared, namely (a) faded manual guidance with visual/verbal cues, (b) faded visual/verbal cues only, and (c) self-discovery. The subjects were 30 students with mild/moderate mental disabilities ranging in ages from 6 to 15 years. They were randomly assigned to one of the three teaching methodology groups. Each group participated in a pre-test, five training periods, a post-test, and a test for retention. There was no significant difference in learning the tasks among the three groups. The subjects that were trained using the faded manual guidance teaching methodology, however, appeared to benefit more from participation in their training program.

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CHAPTER 1

SCOPE OF THE STUDY

Introduction

The ultimate goal of educators is for the student to learn or achieve "relative permanent changes in behavior" (Schmidt, 1988). A teacher must employ specific methodologies or techniques in presenting and reinforcing new ideas or concepts so that the student may achieve the goal of learning. Cratty (1980) described four general techniques/modalities that may be used in instruction when presenting a concept. They are (a) verbalization, use of the spoken word; (b) visualization, including use of the printed word, demonstration, or video; (c) kinesthesis, referring to use of feedback from exteroceptors and proprioceptors; and (d) use of a combination of any of the above.

Kinesthesis can be categorized into at least two different processes or definitions. One such definition is what may be referred to as kinesthetic exploration (Fait, 1978). Kinesthetic exploration occurs when the learner attempts the skill independently and makes muscular adjustments to get the desired results with his performance (Cratty, 1980). The other process of kinesthesis is that of someone physically guiding or manipulating the learner's body part (arm, leg, hand, or head) involved in the activity

through the performance of the skill (Macrae and Holding, 1966). This process is referred to by a variety of names, such as (a) manual guidance, (b) physical guidance, (c) physical prompting, (d) hand-over-hand, (e) manual kinesthesis, or (f) physical cues. In the present study this type of kinesthesis will be referred to as manual guidance.

The effectiveness of giving visual and verbal cues, or a combination of the two when teaching motor skills, is an accepted teaching practice (Dunn and Fait, 1989). It is also accepted that kinesthetic exploration, wherein the learner utilizes his/her proprioceptive feedback as an error detection device to aid in correcting and improving the skill, is an integral part of the learning process. Although some teachers often regard manual guidance as an effective pedagogic modality and use it as an everyday technique in teaching motor tasks, its efficacy as a teaching technique has been questioned. Stelmach, Kelso, and Wallace (1975) and Kelso (1977) have reported the superiority of the self-discovery method of learning over that of manually guided learning. Singer and Pease (1976) suggested that manual guidance may in fact slow the learning process, or prevent learned behavior from occurring by preventing the error correction process from taking place. Singer (1982) states that the use of manual guidance is not based on any conclusive experimental findings. Sage (1984)

believes that manipulating a person's body may send confusing or inaccurate signals to the brain when that individual is attempting to process the motor information.

It is generally recommended that all supplementary cues should be removed from the learning process as soon as possible (Singer, 1982). Thus, it would appear that the effectiveness of manual guidance as a teaching technique may depend on how it is applied. It might be postulated that guidance should be used only in the initial stages of instruction and then only until the learner demonstrates a semblance of knowledge of the skill being taught. At this point manual guidance could be faded as more conventional or intrinsic processes contribute to learning the skill. The fading technique, as it is generally referred to, was initially shown to be an effective method of administering manual, verbal and visual guidance cues (Ludgate, 1923; Koch, 1923).

Another consideration is subject population. Manual guidance tends to be used more extensively in teaching motor skills to individuals with neurological impairments, or to other special populations with limited capacities, than with the individuals who are non-disabled. It would appear feasible that individuals with neurological dysfunction may not be in as good a position to use visual or verbal cues due to deficits in sensory reception and/or information processing capabilities. Tactile prompts (manual guidance)

could be the best way to teach such students. Thus, it would appear desirable to learn more about the role of stimulus modality in teaching motor skills to individuals with limited capacity who, very possibly, do not learn motor skills precisely in the same way as the individuals that are non-disabled or with full-capacity.

Purposes of the Study

The purpose of this study was to determine if manual guidance was an effective methodology to use in teaching a psychomotor task to individuals with mentally disabilities. Specifically, the following questions were addressed:

1. Is manual guidance an effective method for teaching fine motor skills to individuals with limited capacity?
2. Can individuals with limited capacity learn a fine motor task with only visual and verbal cues provided?
3. Can individuals with limited capacity learn a fine motor skill via a self-discovery (trial-and-error) method?
4. Can individuals with limited capacity retain a learned fine motor skill when manual guidance is used as a teaching modality?

Research in teaching modalities and how these techniques are dispensed, specifically that of manual guidance, may be of interest to classroom instructors (both special and regular education) who teach handwriting, psychomotor skills and sport skills. Parents and teachers of children with mental disabilities who address daily

living skills of feeding, dressing, and ambulation, and often use manual guidance as a primary mode of presenting and reinforcing the motor task to the learner, may also benefit from this research. If manual guidance is not a viable or effective method of teaching motor skills, it is important that further research be conducted in order that more efficent methods can be determined.

Hypothesis

Because individuals with limited capacity may not be able to interpret and/or use stimuli with the same proficiency as someone with full capacity, and because very limited research has been done to test this notion, it was hypothesized that some limited capacity models (e.g., those who are mild/moderately disabled) would learn and retain a motor skill better when manual guidance was combined with visual and verbal cues than when visual and verbal cues were used alone, or when no guidance was provided.

CHAPTER II

REVIEW OF LITERATURE

Introduction

Although information and studies providing research findings on the proper methodology of teaching a psychomotor skill to the full capacity individual are often found, research on teaching psychomotor skills to the limited capacity individual is rare. Despite the lack of research in this area, the use of manual guidance is often recommended as a teaching strategy by authors of texts for those with mental disabilties (Thornley, 1973; Abrams and Helainfo, 1975; and Dunn and Fait, 1989).

Those that argue against the use of manual guidance as a teaching method base their beliefs on research conducted with individuals of full capacity. According to Singer (1980), the educators or authors that advocate the use of manual guidance base their beliefs more on common sense and generally not on scientific findings. Some of these individuals also believe that the way it is administered and the timing of its implementation in the learning process are important factors. In this section research on (a) arguments for manual guidance, (b) arguments against manual guidance, and (c) techniques for applying manual guidance to increase its effectiveness is reviewand and summarized.

Arguments for Manual Guidance

Educational methodology in general embraces manual guidance as an effective teaching tool and instructors of motor skills utilize this technique daily when presenting a task to a learner; this is especially true when the learner is mentally disabled. Feeding, dressing, walking, and writing are among the variety of motor skills taught with manual guidance as a primary mode of sensory input. One of the earliest studies related to manual guidance was conducted by Ludgate (1923); she concluded that manual guidance was beneficial in helping adults learn a stylus maze task faster than those adults who learned the identical task without manual guidance. Six groups of fifteen subjects were taught the task as follows: Group 1, undirected, trial and error; Group 2-guidance provided on trials 1-4; Group 3, guidance provided on trials 1-8; Group 4, guidance provided on trials 1-12; Group 5, guidance introduced on trials 5-8; and Group 6, guidance introduced on trials 9-12.

The findings included:

(1) Controlled trials with manual guidance proved more effective than those without manual guidance.

(2) Effectiveness increased in proportion to the amount of guidance given up to a certain point, additional amounts produced less beneficial results.

(3) The effectiveness of manual guidance varied directly with proximity to the initial trials. If it were given at an early stage in learning it exerted a beneficial influence; but when it was interjected at an advanced stage in learning, its benefits diminished.

Koch (1923), in a follow-up of Ludgate's study, also found that manual guidance was an effective teaching strategy for adults. She concluded that learning a maze task was based on three interrelated factors; namely, the amount of guidance given, the position in the learning period at which the guidance was provided, and the nature of how the guidance was faded. Koch concluded that manual guidance provided during the initial part of training produced a positive correlation between the learning period and the retention period; however, if guidance was introduced toward the end of the training, it produced negative results.

Azrin, Schaeffer, and Wesolowski (1976) used manual guidance as the primary mode of sensory input in training profoundly retarded adults to dress and undress themselves. Their subjects had an average social age of 1.6 years, no functional speech, and no physical impairment. The criterion for learning was that, following training, the student could put on each of the five garments without assistance. Their instructional procedure provided

multisensory information (i.e., verbal, visual, and tactile). Presentation of the skill included a forward sequence of steps, intermittent manual guidance, verbal prompting, praise, graduated garment sizes, and an emphasis on reinforcements. All seven students learned to dress and undress themselves and averaged a 90% success rate; the average time required for mastery of the motor task was about ten hours of training time. The research design did not, however, specifically test the efficacy of manual guidance; moreover, their failure to use a control group lessens the contribution of their research to the literature.

Collier and Reid (1987) also conducted an investigation in which manual guidance was an ingredient of the teaching model. They investigated the relative efficacy of two instructional models designed to teach bowling to boys with autism. The "extra-stimuli" model used extensive manual guidance with visual and verbal prompts. The "within-stimuli" model minimized prompts with minimal verbal input to keep subjects on task. Using the theory of overselectivity (over-stimulation results in negative effects), they predicted that the limited prompt model would be more effective. The dependent variable was improvement on the bowling task as determined on a 14-level task analysis. Their results indicated that the boys in the extra-stimuli model performed significantly better ($p < .05$)

than those in the within-stimuli model. One of the explanations that they offered for this finding was that the "extra-stimulus" model provided tactile feedback, and that tactile stimuli might aid autistic children moreso than non-disabled children.

Several authors have submitted opinions on the efficacy of manual guidance. Cratty (1964) has suggested that manual guidance has the potential to mold the child's performance into the desired form through the physical correction of movements. If it is given during the initial phase of the learning process, Cratty states, it usually results in quicker learning because it transmits knowledge of spatial relationships, the desired speed of movements, and/or the muscular force needed. In a more recent discussion, Cratty (1980) states that for those students who fail to grasp the concept through explorative, visual or verbal means, manual guidance is extremely helpful. Macrae and Holding (1966) state that physically guiding the learner's movements is a way of ensuring practice without errors. Abrams and Helainfo (1975) suggest that individuals with neurologic impairment often have limited cognitive capacity to process information visually or auditorily; thus, for them manual guidance may provide the the only channel through which sensations can be correctly interpreted. Fait (1978) states that manual guidance is the most successful technique for teaching motor movements to the severe/profound mentally

disabled population because they may not be able to perceive the nature of the action until they are moved through the proper movements. Without citing a basis, Singer (1982) states that the manual guidance approach is often used effectively with children who have learning disabilities.

Several authors have provided suggestions on how to teach psychomotor skills to the limited capacity individual by utilizing manual guidance in combination with verbal and visual cues. Davis (1968) suggests that when teaching mentally retarded children, "...use the kinesthetic method of moving the child through the movement" (p. 6). Thornly (1973) details the steps on how to teach self-feeding to mentally disabled persons. She states "Take the child's hand firmly and help him pick up his spoon" (p. 31) and follows with "With your hand over his, dip the spoon..." (p. 32). Every step of the task involves teaching the skill with manual guidance as a primary teaching modality. Abrams and Helainfo (1975) declare "Assist the child to complete the task successfully by prompting him--by actually physically moving him through the required behavior" (p. 93). They detail a series of daily living skills to teach the mentally disabled child and in each skill the use of manual guidance in conjunction with verbalization and demonstration is the preferred teaching method.

Cratty (1964) has offered several guidelines regarding when manual guidance in combination with visual and verbal

cues can be most effective in teaching psychomotor skills to mentally disabled individuals. These opinions include:

(1) Manual guidance and verbal instruction appear to work more effectively when used in the early stages of learning a skill.

(2) An awareness of the mechanics and spatial relationships in performance of a task are perhaps received best through verbal and manual guidance.

(3) Instruction of all kinds is most effective during initial stages of learning, but tends to interfere during latter stages.

(4) A combination of manual guidance, visual demonstration, and verbal description, as well as practice, combine for optimal effects (Cratty, 1964, p. 259-261).

Many of the same authors have opinions and concerns regarding the proper timing and method of administering manual guidance if it is to be effective. These opinions are presented in Section 3 of Chapter II, entitled "Methodology of Manual Guidance."

Arguments Against Manual Guidance

Experts with views in opposition to the effectiveness of manual guidance generally base their contention on the term "feedback." Feedback is information that is received during performance of a skill and it is used to assess the

correctness of the movement. Intrinsic or inherent feedback is what one senses or discerns concerning the movement of his/her body and its orientation in relation to space. This information is provided by proprioceptors located in joints, muscles, tendons, and the inner ear. These feedback messages might include the extent to which the knee or elbow was bent, the amount of force used during the execution of the task, and the exact positioning of the head at a specific time during the performance. The feedback in essence acts as an error detection device and the learner uses this information to correct and improve the skill. Sage (1984) contends that when a learner is manually guided through the skill, he/she will not receive the same intrinsic feedback they would get if the task were performed independently. Learning, manual guidance opponents argue, is not going to occur without this feedback.

There are relatively few studies which directly test the efficacy of manual guidance. Singer and Pease (1976) compared the effects of a guided instructional strategy (visual guidance only), a discovery instructional strategy, and a combination discovery-guided strategy on initial task learning, retention, and transfer to a second related task. The subjects were taught a task that involved a computer-managed novel serial manipulation apparatus which contained eight hand-manipulative objects and four foot pedals. The guided learning and combination learning groups performed

significantly better than the discovery learning group in the learning of the task. The opposite was true on the retention test administered the following day; the discovery group performed signficantly better on the task than the other two groups. Singer and Pease deducted that the discovery method of teaching was the most effective means of learning the task. Relative to transfer effects, initial performances favored the discovery learning and combination learning groups.

Stelmach, Kelso, and Wallace (1975) examined whether location cues were primarily encoded independent of the movement presentation mode; the psychomotor task was a rapid positioning one which involved blindly sliding a ball bearing vertically along a metric scale to a designated position without the use of vision. The subjects recalled target locations under preselected, constrained, and passive movement conditions. The preselected group was allowed to choose the degree or location where they would move the ball bearing prior to doing the task. The constrained group actively moved to the endpoint without knowing their destination, but was stopped by mechanical barrier stops. The passive group was moved by the experimenter to a mechanical stop. The subjects attempted to reproduce their movement immediately or 15 seconds after initially completing the task. Recall of target location in the

preselected condition was superior to that in either the constrained or passive conditions.

Kelso (1977) utilized the same task as Stelmach, et al. (1975) to compare self-discovery methods of teaching with manual guidance methods. Although he determined that the voluntary and non-controlled movements facilitated retrieval strategies (retention), he suggested that manual guidance may possibly provide some type of motor image.

Sage (1984) believes the employment of "kinesthetic cues" (manual guidance) as a teaching technique poses serious difficulties for the learner because (a) it is not clear to what extent kinesthetic cues are used by the learner; (b) if he/she is operating under another's guidance, the learner will be subjected to a bewildering number of proprioceptive signals prior to, during, and immediately after execution of a movement; and (c) there is no consistent body of research findings which indicate that manual guidance is an effective instructional method. Although Cratty (1964) suggested that manual assistance may help learners "get the feeling of the movement," Sage (1984) contends that there is little support for this claim because the passive movement of body segments would not be expected to produce the same pattern of afferent impulses as active movements.

Schmidt (1988) suggests that much of manual guidance's apparent contribution may be in getting the response "into

the ballpark" (p.420). Although he believes it might be helpful initially, he states that the physical prompt may serve as a crutch so that when manual guidance is removed, there will be a marked reduction in skill level. He further argues that learning is a "trial and error" or discovery procedure and that manual guidance may prevent the learner from receiving information about his/her errors and thus have a deleterious effect on learning. Schmidt also believes that the important question is whether performance gains will survive a transfer test after manual guidance is removed. It is his contention that under a guided instructional strategy with heavy prompting and cueing, subjects retain and learn less than those subjects taught via a self-discovery method.

The arguments presented against the use of manual guidance are strong. However, it should be mentioned that all of these arguments are based on research conducted with individuals of full capacity (i.e., individuals who do not have deficits in sensory perception and/or information processing abilities). It is argued that it may be inappropriate to assume that individuals with limited capacity learn and/or process sensory information precisely the same way as individuals with full capacity.

Methodology of Manual Guidance

As stated previously, many educators of students with full and/or limited capacity are of the opinion that manual guidance should be an integral part of the teaching process. There also seems to general support for the notion that for manual guidance to be effective, it should be faded. Fading is defined as providing the guidance during initial learning stages and gradually removing the cue when the learner is capable of performing independently (Folio, 1986). Ludgate (1923) found that manual guidance administered in the early stages was beneficial, but that decrements or diminished increments in learning occurred when guidance was administered over too long a period of time. The effectiveness of manual guidance increased in proportion to the amount of guidance given up to a certain point; after this, additional amounts produced less beneficial results. Azrin, Schaeffer, and Wesolowski (1976) demonstrated the effectiveness of fading physical prompts through graduated guidance when teaching severe/profound mentally disabled adults to dress; when faded guidance was used, 90% of their subjects were successful in learning to dress themselves. Sedlak and Sedlak (1985) state that failure to fade can lead to too much dependence on the cue which may prove detrimental to learning. Abrams and Helainfo (1975) and Gold (1980) agree with these opinions and state that as skill level progresses, the prompt should be reduced or

faded until the learner is independently performing the task.

In addition to fading manual guidance cues, the timing of the fading also appears to be an important consideration. Ludgate (1923) and Koch (1923) conclude that maximum effectiveness of manual guidance occurred when it was introduced in the early learning stages of a stylus-maze task, and that when manual guidance is interjected in later learning stages, it is detrimental to learning. Cratty (1964) contends that if manual guidance is introduced too soon, the learner may not have the opportunity to explore the general nature of the task. Cratty also believes that if it is given too late in the learning process, habits may have become fixed and manual guidance may confuse the student.

Another point to consider when using manual guidance is the concurrent use of other modalities. Cratty (1964) is of the opinion that manual guidance combined with visual and verbal input combine for best results. Abrams and Helainfo (1975) and Folio (1986) concur that pairing verbal with physical prompts facilitates teaching motor skills to those individuals with mentally deficits.

A last point of concern is that of determining the proper way or the correct way to physically move an individual so that manual guidance will be the most effective. Cratty (1964) states that if movements are too

enthusiastically guided by an instructor, it may delay the learner gaining the "feel" of the task. He also cautions that inexpert guidance could cause the opposing muscles, or unnecessary muscle groups, to be forcefully brought into play. Fait (1978) is of the opinion that it is extremely important that the teacher move the body part the same way each time to avoid confusion.

The type of task that is to be taught may also be a factor in helping to determine if manual guidance should be used (Schmidt, 1988). Schmidt suggests that tasks that are slow in time may lend themselves better to manual guidance; however, he contends that it is less effective with rapid and ballistic type skills.

Summary

Research findings involving the use of manual guidance are conflicting and inconsistent. Ludgate (1923) and Koch (1923) tested its efficacy and found it to be a beneficial modality when teaching a small maze task. However, their research is quite old and no replication of their research paradigm was found. The fact that Ludgate and Koch each stressed the importance of fading adds some credance to their research. In addition, some authors support the contention that manual guidance is an acceptable and appropriate method of teaching motor skills to special populations (Cratty, 1964; Davis, 1968; and Fait, 1978).

Based on research with subjects with full capacity, the efficacy of manual guidance has been seriously challenged by Stelmach et al. (1975) and Kelso (1977); they are of the opinion that this methodology can impede the learning and retention processes of some psychomotor skills. Sage (1984) states that manual guidance does not work and that it is apt to interfere with the learning processes. There are others who have questioned manual guidance's efficacy, but believe it may, in some way, play a small role in skill acquisition. For example, Singer (1980) believes that manual guidance may possibly provide the learner with a motor image; however, he also contends that voluntary and self-discovery methods of learning are far superior in producing results. Schmidt (1988) appears to be an opponent of manual guidance, but suggests that the method may contribute in some limited way to the learning process. Although Cratty (1964) seemingly agrees that manual guidance was an effective method of instruction in his earlier writings, in later writings (1989) he appears to be taking a "middle of the road" stance.

A limited number of studies have been devoted to directly determining the effectiveness of manual guidance as a teaching modality (Koch, 1923; Ludgate, 1923; Stelmach et al., 1975; and Kelso, 1977). These opposing views and lack of direct studies present a confusing picture to the educator who is attempting to effectively teach motor skills

to the individual with mental disabilities. It should be reiterated that research thus far has utilized subjects with full capacity. For the individual with limited capacity no actual studies were found that directly tested the efficacy of a manual guidance training program. It would be presumptuous to assume that subjects with limited capacity utilize and interpret sensory information precisely the same way as those who are non-disabled.

CHAPTER III

METHODOLOGY

Introduction

This research consists of a two-phase pilot study and the primary study. The pilot study was conducted in two phases with non-disabled subjects; its purpose included the selection of a testing protocol that would (a) allow precise measurement of the effectiveness of manual guidance in teaching a psychomotor skill and (b) be simple enough to be used by students who were mentally disabled. A second purpose was to pilot-test a manual guidance training program with children who were non-disabled. The purposes of the primary experiment were to apply the information gained from the pilot study to improve the manual guidance training program and to determine its efficacy in teaching a psychomotor skill to students with mild and moderate mental disabilities.

Apparatus

Simple rhythmic tapping in conjunction with an external stimulus was selected as the experimental task in this research. This task calls for the subjects to reciprocally tap their hands coincident with an auditory, visual, or tactile stimulus. The equipment and task have been utilized in motor behavior research in the past (Liemohn, Hargis,

Wrisberg, and Winter, 1990). Its hardware includes a Zenith microcomputer programmed to generate the stimuli and score the responses. In this investigation the only stimulus modality used was auditory; it was a short beep presented through a speaker placed in front of the subjects but out of their visual field. Each trial included a 6-tap warm-up phase (with the stimulus) followed by a scoring phase in which the stimulus was presented ten times at the same Hz. The subjects were instructed to tap in concert with the auditory stimuli on two 8-cm pressure-sensitive circular pads. The pads were spaced 22 cm apart at table height directly in front of the seated subject. The subject's score for each trial was the mean intertap interval for their 10 taps; this was also the dependent variable in the research cited (Liemohn, et al., 1990).

Pilot Study

Phase 1

The objective for conducting the Phase 1 of the pilot study was to determine an ideal frequency rate of stimulus presentation. Phase 2 and the primary study utilized the results of Phase 1.

Subjects

The subjects were 11 students, ages 6-11 years, who were enrolled in a University of Tennessee Day Camp. They

were considered of normal intelligence with no known or obvious physical impairments, and each had the consent of their parents to participate (Parental Consent Form included in Appendix A).

Procedure

The subjects were first provided a brief three-to-four minutes of initial instruction. This instruction included a verbal explanation of the equipment and testing protocol followed by a visual demonstration in which the researcher performed one trial. The subject was allowed one warm-up trial to determine if he/she comprehended the task; all subjects appeared to understand the task after the initial demonstration.

Following this, each subject attempted one trial with each of three auditory stimulus intervals: 500, 750, and 1000 ms. After each trial there was a one-minute discussion between the researcher and subject for the purpose of relaxation.

Results/Discussion

Because the stimuli were presented at intervals of 500, 750, and 1000 ms, the best scores attainable were 500, 750, and 1000, respectively. The Hz level did not appear to have a significant effect on tapping performance, thus any one of them might have been selected. However, in part because the

750 ms was also used in the previously cited study (Liemohn, et al, 1990), this Hz level was chosen for the subsequent testing.

Phase 2

The second phase of the pilot study was conducted primarily to derive a training protocol for use in the primary study.

Subjects

The subjects were 8 of the 11 children who had participated in Phase 1. They consisted of seven boys and one girl, ages 6-11 years.

Procedure

The eight subjects were randomly assigned to either a treatment group or a control group. Each group was taught the identical tapping task utilized in Phase 1. A pre-treatment test was given on the first day to both groups to determine the subjects baseline performance on the task. It was subsequently determined that these data may have misrepresented the students' skill. For this reason only the training protocol will be presented and there will not be a discussion of pre- and post-treatment comparisons.

The subjects received five training sessions with one session being provided each day. Each session consisted of

one warm-up trial and four additional practice trials; these sessions were 12-15 minutes in duration. Each subject completed 5 trials each session. The warm-up trial was attempted without manual guidance. The next trial was manually assisted by the researcher, with the third trial unassisted, the fourth assisted, and the fifth unassisted. This procedure was designed to determine the subject's reactions to manual guidance and to assist the researcher in determining how to conduct manual guidance in the primary experiment. Visual and verbal techniques augmented the training.

Verbal cues included such statements from the researcher as "You need to speed up," "You're going too slow," "Listen to the beep,"and "Tap right on the beep." Verbal feedback was given during and after each trial and verbal praise was given after each trial. A visual cue was provided by allowing the subject to view his/her scores on the computer screen and count the scores that were within 25 ms of the 750 ms stimulus interval. This visual technique provided for some a challenge to beat the previous score. The manual guidance consisted of the researcher placing her hand on the top of each of the subject's hand, holding the subject's hands and physically rhythmically tapping the subject's hands on the plates for him/her.

The subjects were generally passive and did not try to tap but let the instructor do the tapping for them. The

subjects in the control group were taught the task by using identical visual and verbal procedures but without the manual guidance component. The visual and verbal cues were given infrequently and only when deemed necessary to keep the student on task. This method of teaching is a form of trial-and-error or a self-discovery method of learning.

Results/Discussion

It should be reiterated that the primary purpose of Phase 2 was to derive a viable training protocol for the primary experiment. The findings identified shortcomings in the training protocol; the principal judgments that were gleaned from Phase 2 included determination of effective:

(1) Verbal and visual cues that could be used to initiate responses from the learner.

(2) Praise techniques.

(3) Methods of physically administering manual guidance to the learner.

(4) Methods of fading the tactile, verbal, and visual cues.

Primary Study

The purposes of the primary study were to determine if learning and retention of a simple motor skill could be significantly improved through a faded teaching methodology of visual/verbal and manual guidance as compared to (a)

faded visual/verbal method or (b) a minimal visual/verbal (self-discovery) method.

Subjects

The subjects were 30 students with mild/moderate mental disabilities in St. Tammany Parish Schools' Special Education Department, State of Louisiana. Consent for their participation was received from their parents; a copy of the Parental Consent Form is included in Appendix A. The Mild/Moderate Mentally Disabled classification was assigned to these students based on the accepted exceptionalities as printed in Bulletin 1508, Louisiana's Special Education Regulations (1988). Bulletin 1508 defines mentally disabled as those students who have significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior and manifested during the developmental period. The intelligence of the subjects fell between two and four standard deviations below the mean as measured on either the WISC-R or the Stanford-Binet IQ test. Their ages were 6-15 years and no subject possessed a known or obvious physical impairment that interfered with task performance.

Procedures

Each subject met with the investigator a total of eight times for 12-15 minutes each session. The sessions included one day for the administration of the pre-test, five

treatment days, one day for administration of the immediate-retention test, and one day for the administration of the delayed test for retention. With the exception of the administration of the delayed retention test, all sessions occurred within ten school days. The test for delayed retention was given seven days after the immediate-retention test.

After meeting with the subjects' teachers and at their suggestion, a reward system for participants was derived. Stickers, Mardi Gras beads, rings and small animal erasers were deemed appropriate; candy was the reward for the older students. In addition to daily rewards, all students who completed the study were given a Certificate of Achievement. Additionally, a Slinky, Jr. was given to the younger students after completion of the study, and the older students were awarded a dollar.

Pre-test

The pre-test was conducted on the first day of the study. The instructor began the pre-test by providing a brief introduction of herself and a few personal statements to put the student at ease. Familiarization of the equipment followed and included the following statements:

"This is what you will tap (pointing at the pads)," "You will tap the pads with your fingers (pointing at the student's four fingers on each hand"), "This box

will make the beeping sound (pointing at the auditory stimulus box)," and "The computer will tell me how well you are tapping (pointing at the computer)."

The researcher then demonstrated one tapping trial for the student, administered in conjunction with the verbal cues of "Tap with the beep" and "Tap this hand, then the other hand, then this hand." After the demonstration a short discussion followed, which included asking the subject two or three questions to determine his/her comprehension of the task.

The investigator then asked the student to attempt the task. A practice trial was given to determine if the student understood the rudiments of the task. If the student was not tapping on the circular pads, or was tapping so lightly that results could not be recorded, the researcher prompted the student by verbally correcting and/or by demonstrating the task again.

After the practice trial, the subject performed three test trials. The three mean intertap interval scores were averaged together to provide each individual's pre-test score. The pre-test took an average time of 12 minutes for each subject.

Treatment

The treatment consisted of five days of training on the rhythmic tapping task. Each treatment session was

approximately 12 to 15 minutes in duration and included 7 practice trials on each day.

Experimental/Control Groups

The thirty students were distributed by random assignment into one of three instructional groups. The instructional groups included the Manual Guidance Group, the Visual/Verbal Group, and the Control Group. Each group was taught the tapping task using one of three techniques of one-on-one instruction. All three groups were provided the following visual and verbal instruction:

(1) Statements to get the student interested in the session, included: "We are going to play on the computer today," and "Let's see how good you can tap today," "If you do all of your work, you will get a prize."

(2) A demonstration of one trial conducted by the researcher accompanied by the following statements: "Use your fingers and tap the plates," "Tap right on the beep," "Tap this hand, then the other hand, then this hand."

(3) After the demonstration a statement by the researcher requested that the student attempt the task--"Let's try to tap on the plates," and "When I say 'Ready--Go!'" you may start tapping".

Additional verbal prompts were provided during the trials and between trials as needed to keep the student on task. "As needed" was defined as when the subject stopped tapping for any reason, or appeared not to be listening to the stimulus. Prompts to keep the subject on task included the following: "Listen to the beep," "John, pay attention," "If you want that prize, keep tapping." Verbal praise such as "Good job," "Way to go," "I like the way you are tapping your right hand and then your left hand," and any other form of praise that was deemed appropriate for the occasion was given at the end of each trial in an attempt to reinforce and motivate the student. After each trial each subject was allowed to view his/her scores on the computer screen and count the scores that were within 25 ms of the 750 ms interval that the stimuli were presented. Although some subjects did not comprehend the performance data, it provided them with a brief respite between trials as well as being fun for some. Before beginning a new trial the instructor stated "Let's try that again," and "Ready, Go!"

Manual Guidance Group. This group was provided the teaching component of faded manual/verbal guidance administered during trials. The manual guidance consisted of the researcher placing her hands on top of the subject's hand, holding the child's hands and physically tapping the subject's hand on the plates for him/her in synchrony with the stimulus throughout one trial. Verbal instruction

accompanying the manual guidance included the exact following statements: (a) "Tap, Tap, Tap..." as the researcher guided the child' hands; (b) "Tap right on the beep" as the researcher held and tapped the child's hands; and (c) "This hand, now this hand" as the researcher guided the child's hands.

The term "fade" is defined as gradually removing the prompt or providing the manual/verbal prompts heavily during the earlier stages of learning and gradually delivering less assistance until no cues were administered during the last session. The fading schedule for manual/verbal prompting for the Manual Guidance Group was conducted as follows:

Day 1 - Prompts administered every trial.

Day 2 - Prompts administered on Trial 1, 3, 5, and 7.

Day 3 - Prompts administered on Trials 1 and 4.

Day 4 - Prompts on Trial 1 only.

Day 5 - No additional prompting verbally or tactually except for initial instruction and for the purpose of keeping students on task.

Visual/Verbal Group. This group was taught the tapping task utilizing the visual-verbal instructions at the beginning of each session; it was combined with the added teaching prompts of faded visual/verbal cues delivered <u>during</u> the tapping trials. The fading schedule was the same as that which was used for the Manual Guidance Group. The faded visual/verbal cues were conducted during the trials as follows:

(1) Throughout the trial the researcher tapped on the desk in time with the stimulus mirroring the exact taps the child should be doing in an effort to get the student to alternate hands and tap with the stimulus.

(2) The researcher stated "Tap like me" while tapping on the desk.

(3) The researcher corrected verbally incorrect performance, utilizing the statements of "Tap faster" or "Tap Slower," tap this hand, now the other hand;" selecting the phrase that was needed at the appropriate time.

(4) The researcher provided praise and prompts to keep the child on task as needed.

(5) The researcher allowed each student to view his/her scores between trials.

Control Group. This group was taught the tapping task utilizing a self-discovery method or trial-and-error technique. Visual and verbal guidance as previously detailed was provided by the instructor only at the beginning of each session and when deemed necessary to keep the student on task. No other instruction on how to do the task was given during the session.

Retention Tests

All subjects were post-tested on the first school day following their last training session to determine if a training effect occurred. This test is referred to as the immediate retention test. One week later they were retested to determine the amount of retention of the learned skill. This test is the delayed retention test. The immediate retention test and the delayed retention test were administered and scored in the same manner as the pre-test.

CHAPTER IV

RESULTS AND DISCUSSION

Results

The purpose of the study was to determine if the two treatments or instructional programs designed to improve rhythmic tapping performance were effective for subjects with limited capacity. The reliability of the pre-test was determined by computing an intra-class correlation coefficient between the second and third administrations of the pre-test; this coeficient was .60. Analysis of the data (SAS's Proc GLM) were based on a Group x Test (3 x 3), repeated measures design with subjects nested in Group (Figure, Appendix C). The results were utilized to (a) compare the three groups at each test time and (b) determine if the treatments had a significant training, retention, and/or overall learning effect on the performance/learning of the rhythmic tapping task. The presentation of the results is divided into the two categories of (a) group differences, and (b) experimental effects.

Group Differences

This section will present a comparison of the three experimental groups on the pre-test, immediate retention test, and delayed retention test.

Pre-test

These scores are presented in Table 1, Appendix B; because the stimuli were presented at 750 ms intervals, scores closest to this figure were the best. Although the three groups were dissimilar in their pre-test scores, the analysis indicated that the groups were not statistically different ($p > .05$) prior to the application of the treatments.

Immediate Retention Test

On this test all three groups were closely grouped (Figure, Appendix C); again there was no statistical difference ($p > .05$, Table 2, Appendix B) in their scores.

Delayed Retention Test

In the test for delayed retention there was more divergence of scores than in the immediate retention test; however, these differences were not significantly different ($p > .05$, Table 3, Appendix B).

Experimental Effects

Treatments

This section examines treatment effects and includes a comparison of pre-test and immediate-retention test scores of the three experimental groups (Table 4, Appendix B).

Manual Guidance. The Manual Guidance Group demonstrated a significant improvement in rhythmic tapping performance (Table 4, Appendix B; Figure, Appendix C). Their pre-test and immediate retention intertap interval scores were 629 and 694 ms, respectively (perfect score = 750 ms); their improvement was statistically significant ($p = .01$). In addition, their immediate retention test scores indicated less variability than their pre-test scores.

Visual/Verbal. The Visual/Verbal Group also demonstrated a significant improvement in rhythmic tapping performance (Table 4, Appendix B; Figure, Appendix C). Their pre-test and immediate retention intertap interval scores were 642 and 698 ms, respectively; their improvement was statistically significant ($p = .01$). In addition, their immediate retention test scores were also less variable than their pre-test scores.

Control. The Control Group also demonstrated a slight improvement from pre-test to immediate retention test performance (Table 4, Appendix B; Figure, Appendix C). Their pre-test and immediate retention intertap interval scores were 667 and 694 ms, respectively; this group's improvement was not significant ($p = .1571$). Their immediate retention test scores were more variable than their pre-test scores.

Delayed Test for Retention

This section includes the effectiveness of the two treatment programs and no treatment on the delayed test for retention of the rhythmic tapping skill. These data are delineated in Table 5 (Appendix B).

Manual Guidance. The Manual Guidance Group demonstrated little change in tapping performance (Figure, Appendix C). Their immediate and delayed retention scores were 694 and 697, respectively (perfect score = 750 ms); this change was not statistically significant ($p > .05$; Table 5, Appendix B). In addition to maintaining their performance scores, their delayed retention test scores were less variable than immediate retentiion test scores.

Visual/Verbal. The Visual/Verbal Group's scores also demonstrated little change (Figure, Appendix C). Their scores were 698 and 675, respectively; the analysis indicates the loss was not significant ($p > .05$; Table 5, Appendix B). The variation within their scores increased during the retention phase.

Control. The Control Group's scores also demonstrated little change (Figure, Appendix C). Their immediate/delayed test for retention scores were 694 and 687, respectively; this decrease was not statistically significant ($p > .05$; Table 5, Appendix B). Additionally, there was greater variability within the Control Group's scores at immediate retention testing than at delayed retention testing.

Learning

This section describes the effectiveness of the two treatment programs on the overall learning of the rhythmic tapping skill (i.e., pre-test/delayed retention test comparisons). The scores are delineated in Table 6, Appendix B.

Manual Guidance. The Manual Guidance Group's pre-test and delayed retention test scores were 629 and 698, respectively; this difference was statistically significant ($p = .01$; Table 6, Appendix; Figure, Appendix C). The delayed retention test scores were less variable than the pre-test scores.

Visual/Verbal. The Visual/Verbal Group's pre-test and delayed retention test scores were 642 and 675, respectively; this difference was not statistically significant ($p > .05$; Table 6, Appendix B). In addition, the variation within scores was approximately the same at the delayed retention test than it was at pre-test.

Control. The Control Group's pre-test and delayed retention test scores were 667 and 687, respectively; this difference also was not statistically significant ($p > .05$; Table 6, Appendix B). The variability in performance increased markedly from pre-test to delayed retention test.

Discusssion

The analysis of the data for the three groups indicated that there were no significant differences between the three groups at pre-treatment, immediate retention testing, or immediate retention testing times. However, there were differences among the groups in the pattern of performance changes in relation to training effects, retention effects, and overall learning effects. The following section will discuss the trends that were evident between the treatment groups as well as the control group.

Pre-test/Immediate Retention Test Comparisons

Comparing pre-test to immediate retention test scores determined if one of the two treatments had a training effect on the groups' rhythmic tapping performance. After five days of treatment the subjects in the two experimental treatment groups significantly improved in the performance of the task, but subjects in the Control Group did not (Table 4, Appendix B; Figure, Appendix C).

Manual Guidance

This group made the most significant gains; their scores were also the least variable on the immediate retention test (Figure, Appendix C). This would suggest that the treatment using manual guidance with visual and verbal cues produced a training effect. However, it should

be noted that this group began with the lowest score and therefore it had the greatest opportunity to demonstrate improvement.

Visual/Verbal

The Visual/Verbal Group also improved in rhythmic tapping performance; moreover their improvement was comparable to the Manual Guidance Group (Figure, Appendix C) and their scores were very similar with respect to variability (Table 4, Appendix B). The results of the pre-test and immediate retention test comparisons suggest that the visual/verbal treatment program was also effective in producing a training effect.

Control

The Control Group began the experimental program with slightly better rhythmic tapping scores than the other two groups. Analysis of the data indicates that this group had the least improvement from pre-test to the immediate retention test. In addition, they had the greatest variation in individual scores on this test. This would suggest that the self-discovery method may have been ineffective in producing a training effect. However, it must be noted that the possibility of a ceiling effect existed and that as the Control Group began with the highest

average score, they had the least opportunity to demonstrate improvement.

Immediate Retention Test/Delayed Retention Test Comparisons

The comparison of the three groups' immediate retention test scores to their delayed retention test scores is an indicator of retention of the skill learned in the treatment programs. The delayed test for retention was conducted seven days after the immediate retention testing. The scores for these comparisons are delineated in Table 5, Appendix B.

Manual Guidance

The Manual Guidance Group's increase in performance from immediate retention test to delayed retention test was not significant. It may be important to note, however, that this group showed less variability in performance on the delayed test for retention than any other group. The Manual Guidance Group was the only group which performed as capably on the delayed test for retention as they did on the immediate retention test. This suggests that the manual guidance treatment may have been effective in providing group retention. These results provide a positive answer to the fourth research question (Chapter 1) in that individuals with limited capacity can retain a learned fine motor skill when manual guidance is used as a teaching modality.

Visual/Verbal

The Visual/Verbal Group experienced a slight diminishment in performance on the retention test; this change was not significant. It should be noted that the group's delayed retention test scores were more variable than their immediate retention test scores; this possibly indicates some loss in ability to perform the task. The rather large increase in variability among the subjects' scores at delayed retention test could suggest that the visual/verbal treatment program may not have been as effective in providing group retention as the manual guidance treatment.

Control

The Control Group also demonstrated a slight downward trend in performance on the delayed retention test; the diminishment in performance was not significant. This group also experienced increased variability of scores during this time period. As with the Visual/Verbal Group, the increase in the variability may indicate that the self-discovery method may have been ineffective in providing retention.

Pre-test/Delayed Retention Test Comparisons

The comparison of the pre-test scores to the delayed retention test scores was the last step which provided information necessary to determine if true learning, or

"relatively permanent changes in behavior" (Schmidt, 1988), had occurred in either the experimental groups or the Control group. The scores are delineated in Table 6, Appendix B.

Manual Guidance

This group significantly improved and retained their rhythmic tapping performance from the pre-test to the delayed retention test with the manual guidance treatment. Although there was not a statistically significant difference, the Manual Guidance Group's pre-test scores were the lowest scores of all the groups and after completion of the study (i.e., after taking the delayed retention test) their scores were the closest to 750 ms (Figure, Appendix C). Their performance scores were also less variable than the other two groups. The data suggest that a change in behavior occurred within this group and that the manual guidance treatment may have been effective in producing the learned behavior for individuals with mild/moderate mental disabilities. There are, however, two factors which may have contributed to this finding which should be reiterated before accepting the efficacy of the manual guidance treatment program. As indicated previously, an intraclass correlation coefficient was computed to determine the reliability of the pre-test scores. Because this coefficient was only .59, the possibility exists that the

pre-test scores were not accurate indications of the rhythmic tapping performance of all subjects. A second factor which may have made the manual guidance group look better than the other two groups was that this group's pre-test scores were lower, although this difference was not significant. Nevertheless, a possible ceiling effect existed for the other two groups which may have had an untoward influence on the ability of the subjects receiving visual/verbal training, or those participating in the control group, to improve.

The possibility also exists that the aforementioned two factors had a negligible if any effect on the results. If this is true, then it is quite possible that manual guidance is an effective method for teaching fine motor skills to individuals with limited capacity; this responds to the first research question of the study (Chapter 1). The manual guidance method of presenting this task may indeed have by-passed dysfunctional processing schema in these individuals with mental disabilities and facilitated their learning. Abrams and Helainfo (1975) may have been correct when they suggested that individuals with neurologic impairment often have limited cognitive capacity to process information, visually or auditorily, and that manual guidance may be the key that enables some individuals with limited capacities to learn skills such as the one taught in this investigation.

Visual/Verbal

The Visual/Verbal Group's rhythmic tapping scores were not significantly different from pre-test to the delayed retention test. Once the training effect was removed, the group's performance began to deteriorate and began an approach toward its pre-treatment performance (Figure, Appendix C). These results suggest that the visual/verbal treatment was ineffective in producing learned behavior for subjects with mild/moderate mental disabilities. The results also provide a negative answer to the second research question (Chapter 1) in that these individuals with limited capacity did not learn this motor task with only visual and verbal cues provided.

Control

The Control Group's scores indicate that there was no significant improvement in performance from the pre-test to the delayed retention test (Table 6, Appendix B); moreover, the variability of the performance of the Control Group increased markedly. Their rhythmic tapping performance scores had begun a downward trend which was approaching its beginning state. It appears that the self-discovery method of trial and error may not be an effective learning modality. Although not conclusive, these scores possibly provide a negative answer to the third research question of the study (Chapter 1) in that these individuals with limited

capacity could not learn this fine motor task via a self-discovery method.

CHAPTER V

CONCLUSIONS

Summary

In this experiment comparisons were made among three teaching strategies which utilized (a) a faded manual guidance combined with visual and verbal guidance methodology; (b) a faded visual and verbal methodology; and (c) a self-discovery methodology to teach the tapping task to mentally disabled individuals. The findings indicated that no method of teaching was significantly better than any other method. However, the subjects that were trained utilizing the faded manual guidance combined with visual/verbal cues not only demonstrated an improvement in their rhythmic tapping performance, they also demonstrated that they were able to retain this improvement when the delayed retention test was administered. The other groups did not demonstrate a similar change.

As indicated previously, the possibility exists that both (a) the relatively low reliability coefficients on the pre-test and (b) a possible ceiling effect on the gains of the subjects in the Visual/Verbal and Control Groups could have impacted upon the results of this investigation. Other factors include the possible variation in intelligence of students between groups, the time-frame of the study, and the small number of subjects within each group.

Implications

The findings of this study suggest the following conclusions regarding the teaching of psychomotor skills to individuals with mental disabilities.

1. The manual guidance training appears to have efficacy. Possibly this treatment may by-pass the more typical processing schema, which may be deficient in some individuals with limited capacities, and thus enable them to place more emphasis on functional systems.

2. Subjects with limited capacity, such as the students with mental disabilities participating in this study, may not have the ability to process and utilize visual and verbal cues precisely in the same manner as individuals with full capacities. This may explain why that in this investigation neither the self-discovery method nor the visual/verbal guidance were adequate in promoting learning.

Recommendations

The following recommendations are offered for consideration in future investigations with individuals with limited capacity.

1. A longer time-frame between the immediate retention and delayed retention tests could be considered. It might also be desirable to provide additional retention tests at later dates.

2. The subjects could be grouped within a more narrow IQ range; several of the students in the mild IQ range performed the task well without training. A more narrow range may provide a more accurate picture of improved performance. As suggested in the pilot study, this task was generally easy for subjects with full capacity to learn.

3. Some students with mental disabilities appear to benefit from manual guidance in learning some psychomotor tasks. Because a self-discovery approach of trial-and-error appeared inadequate in providing the necessary feedback needed to improve the subject's performance, more research is warranted with teaching strategies which include manual guidance.

4. A comparative study using faded manual guidance with subjects of both full and limited capacity could help ascertain if this type of training is beneficial to only those subjects with limited capacities.

5. Fewer trials per session may be more beneficial. Seven trials for the lower functioning subjects at times produced frustration and lack of cooperation. Five trials may be more advantageous with subjects with limited capacity.

6. A comparative study in which subjects are matched and placed in groups based on their pre-test performance, and using a more rigorous task which has less possibility for ceiling effects.

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APPENDICES

APPENDIX A

LETTERS OF CONSENT

PARENTAL LETTER OF CONSENT FOR PILOT STUDY

THE UNIVERSITY OF TENNESSEE
KNOXVILLE

College of Education
Department of Human Performance
and Sport Studies
1914 Andy Holt Avenue
Knoxville, TN 37996-2700
(615) 974-5111

June 12, 1992

Dear Parent:

I am a doctoral student at the University of Tennessee and have taught school for 16 years. I am interested in determining the best technique to use in teaching a specific motor skill to handicapped children. Due to the diversity of the handicapped population, I wish to try out these teaching techniques with non-handicapped children; it is for this reason I need your assistance.

The task I propose to teach is a simple rhythmic one wherein each child will attempt to alternately tap his/her hands to coincide with a beeping stimulus. The "beep" will be presented auditorily. The actual teaching will be divided into two separate tasks

Task One: I will test one group of children to determine the tapping rate and the number of trials that most children seem to prefer; if your child participates in this aspect of the project his/her total time involvement will be 10-15 minutes, one time only.

Task Two: I will work with two other groups of children. After a pretest each child will be assigned to a group which will be taught the tapping skill either by (a) verbal cues or (b) manual guidance cues. If your child is assigned to either of these groups, he/she will (a) be pre-tested (5-7 minutes), (b) participate in a training program 10-15 minutes a day for four days, and (c) be post-tested (5-7 minutes).

I am most appreciative of your willingness to consider letting your child participate in my pilot study. Although this project may not be of direct benefit to him or her, I think the task will be fun and enjoyable. Moreover, he/she is free to discontinue participation at any time without penalty or prejudice and quitting will have no effect on the services that he/she receives

in the summer camp. However, if your child does participate in this program, it will help us as we attempt to develop teaching programs for children with special needs.

If you have any questions about this project now or later, please do not hesitate to contact us. If you are agreeable to your son's or daughter's participation in our project, please complete the information below and return in the enclosed envelope.

Sincerely yours,

Renae' Wallace

Renae' Wallace

I permit my son/daughter _____(Child's Name) to participate in this research as described; I furthermore realize that he/she may discontinue the project at any time without penalty.

_____ _____

Parent Signature Date

LETTER OF CONSENT FOR CONDUCTING

PRIMARY STUDY IN ST. TAMMANY PARISH, LOUISIANA

Renae' B. Wallace
544 Atalin St.
Mandeville, LA 70448

October 26, 1992

Ms. Carol Smith
Supervisor of Special Education Services
St. Tammany Parish Schools
706 W 28th Avenue
Covington, LA 70430

Dear Carol:

I am currently working toward a doctoral degree at the University of Tennesee in Adapted Physical Education and Early Childhood Intervention. All of my coursework has been completed and I am now attempting to collect data for my dissertation.

The purpose of my dissertation will be to study the effects of physical guidance on learning a motor task with children who have mental disabilities. A pilot study utilizing the same task, equipment, and protocol was conducted at the University of Tennessee on Non-disabled Summer Campers (Ages 6-12) in July of this year.

The task I propose to teach is a simple rhythmic one wherein each child will be asked to reciprocally tap with alternating hands two microswitch-activated pads in concert with a beeping stimulus. The "beep" will be presented auditorily.

Thirty subjects who are mild/moderately mentally disabled will participate in my study. Each subject will be randomly assigned to either of three groups where they will be participating in three different techniques of one-on-one instruction. The three techniques will include: (a) Instruction utilizing verbal and visual cues only, (b) instruction using manual guidance in addition to verbal and visual instruction, and (c) instruction where verbal and visual cues are provided with faded manual guidance; whereas the manual guidance is provided as needed the first two days and gradually withheld until completly deleted by end of training session.

There will be a total of seven training sessions. Day One will be the Pre-test and Day Seven will be the Post-Test. Five consecutive sessions (Day Two Through Six) will comprise the training/learning days for the students. Each session should be approximately 12 to 15 minutes in length.

No risks are expected to occur to the students since the experiment will involve performance of a two-hand coordination motor task that is neither physically nor mentally taxing; moreover, with use of comparable protocols the students have enjoyed the activity. The data will be kept strictly confidential and only the investigators will have access to the data. Data will addres subjects by a subject number to maintain confidentiality. All testing will be conducted on the confines of the school in which the child attends.

The anticipated benefit will be a better understanding of teaching modalities as they affect performance of a motor skill particularly in relation to students with mild/moderate mental disabilities.

A permission form (attached) will be signed by the parent/guardian of each child who is selected to participate in the study. He/She will be free to discontinue participation at any time.

As you know I have had 16 years teaching experience with children with disabilities and without. The co-project director, Dr. Wendell Liemohn, is a professor at the University of Tennessee who has had more than twenty years of professional experience in this type of motor behavior research.

I am requesting permission to utilize thirty children as subjects in this scientific study. The students should be between the ages of six and twelve and currently enrolled in the St. Tammany Parish Special Education Program and diagnosed as having mild/moderate mental disabilities. The schools from which I would like to draw the population would include Mandeville Elementary, Mandeville Middle, Mandeville Jr. High, Covington Elementary and Lyon Elementary.

Thank you for your assistance with this matter. Please call me if you have any questions.

Sincerely,

Renae' Wallace
624-9977

I agree with the proposal and give my permission for this study to be conducted through the St. Tammany Parish Special Education Dept. and within the specified St. Tammany Parish Public Schools.

Carol Smith
Supervisor of Special Education

Terry Bankston
Superintendent of Schools

Laura Allums
Mandeville Elementary

Richard Sylvest
Mandeville Middle School

Gail Sloan
Mandeville Jr. High

Bill Brady
Covington Elementary

Mary K. Koon
Lyon Elementary

PARENTAL LETTER OF CONSENT FOR PRIMARY STUDY

LETTER OF INFORMED CONSENT

January 15, 1993

Dear Parent:

I am a doctoral student at the University of Tennessee and have sixteen years teaching physical education in Louisiana. Six of thse years have been teaching adapted physical education in St. Tammany Parish. I am currently an instructor in Adapted Physical Education at Southeastern La. University. I would like to conduct a study which will help to determine the best technique to utilize when teaching a motor skill to a child with mental disabilities. It is for this reason I need your assistance and that of your child's.

The task I propose to teach is a simple rhythmic one, wherein each child will attempt to alternately tap his/her hands to coincide with a beeping sound.

My study will be composed of thirty children. Each child will be assigned to one of three groups. Each group will be taught the identical tapping task, but a different teaching method will be utilized for each group. The three methods for teaching will include: (a) explaining the task and demonstrating the task for the child throughout the session, (b) explaining the task and demonstrating the task combined with physically guiding the child's hand to complete the task throughout the session, and (c) giving verbal instruction and demonstrating the task only at the beginning of each session. The training sessions will last for eight days and will take from 10 to 15 minutes each day. I will conduct the sessions at your child's school at a time that is convenient for the student and his/her teacher. I will ensure that any activity that is missed may be made up at a later time. If you would prefer I use a specified time--such as physical education time--please let me know. Your child may withdraw from the study at any time without penalty.

I very much would appreciate your allowing your child to participate in my study. I believe this activity will be fun and and challenging for your child, as well as present no risks physically to your child.

If you have any questions about this project now or later, please do not hesitate to contact me. If you are agreeable to your child's participation, please complete the information on the back and return in the enclosed envelope as soon as possible.

Sncerely yours,

Renae' Wallace Phone: 624-9977 or 549-2130

I agree to allow my child_____ (child's name) to participate in this research as described. I understand that the activity will be conducted at school and should take approximately 12 to 15 minutes per day for eight days. I reserve the right to take my child out of this study at any time. I also understand that all data will be held in strict confidence.

_____ _____

Parent/Guardian's Signature Date

I would like my child's session conducted during _____ (specified time--P.E., Recess, teacher's discretion, etc.)

APPENDIX B

TABLES

TABLE 1

PRE-TEST SCORES AND STATISTICS BY GROUP

	Manual Guidance	Visual/ Verbal	Control
Mean	628.87*	642.01	667.13
S.D.	94.58	97.17	57.50
S.E. of Mean	17.87	17.74	10.49

Contrasts	c	p
Control-Man. Guid.	1.49	.2331
Control-Vis./Verbal	.83	.3717
Vis./Verbal-Man. Guid.	.10	.7578

*Scores are in ms

TABLE 2

IMMEDIATE RETENTION TEST SCORES AND STATISTICS BY GROUP

	Manual Guidance	Visual/ Verbal	Control
Mean	694.09*	698.38	693.57
S.D.	73.15	72.03	84.91
S.E. of Mean	13.35	13.15	15.50

Contrasts	c	p
Control-Man.Guidance	.00	.9857
Control-Visual/Verbal	.03	.8666
Vis/Verb.-Manual Guidance	.02	.8808

*Scores are in ms

TABLE 3

DELAYED RETENTION TEST SCORES AND STATISTICS BY GROUP

	Manual Guidance	Visual/ Verbal	Control
Mean	697.94*	674.69	686.74
S.D.	62.65	99.47	117.84
S. E. of Mean	11.44	18.16	21.88

Contrasts	c	p
Control-Manual Guidance	.08	.7769
Control-Visual/Verbal	.12	.7266
Visual/Verbal-Manual Guidance	.41	.5279

*Scores are in ms

TABLE 4

PRE-TEST AND IMMEDIATE RETENTION TEST SCORES

AND STATISTICS BY GROUP

Group	Pre-test	Post-test	Contrast	p
Manual Guidance				
Mean	628.88*	694.09	3.76	.0045
S.D.	94.58	73.15		
S.E. of Mean	17.87	13.36		
Visual/Verbal				
Mean	642.01	698.38	4.11	.0027
S.D.	97.17	72.03		
S.E. of Mean	17.74	13.15		
Control				
Mean	667.13	693.58	1.54	.1571
S.D.	57.50	84.92		
S.E.of Mean	10.50	15.50		

*Scores are in ms

TABLE 5

A COMPARISON OF IMMEDIATE RETENTION

AND DELAYED RETENTION TEST SCORES AND STATISTICS BY GROUP

Group	Post-test	Re-test	Contrast	p
Manual Guidance				
Mean	694.09*	697.94	0.28	.7813
S.D.	73.15	62.65		
S.E. of Mean	13.35	11.43		
Visual/Verbal				
Mean	698.39	674.77	1.80	.1051
S.D.	72.03	99.47		
S.E. of Mean	13.15	18.16		
Control				
Mean	693.57	686.73	0.46	.6546
S.D.	84.19	117.84		
S.E. of Mean	15.50	21.88		

*Scores are in ms

TABLE 6

A COMPARISON OF

PRE-TEST AND DELAYED RETENTION TEST SCORES

AND STATISTICS BY GROUP

Group	Pre-test	Re-test	Contrast	p
Manual Guidance				
Mean	628.88*	697.94	4.4500	0.0016
S.D.	94.58	62.65		
S.E. of Mean	17.87	11.43		
Visual/Verbal				
Mean	642.01	674.76	1.9410	0.0839
S.D.	97.17	99.47		
S.E. of Mean	17.74	18.16		
Control				
Mean	667.13	686.74	0.839	0.4231
S.D.	57.50	117.84		
S.E. of Mean	10.50	21.88		

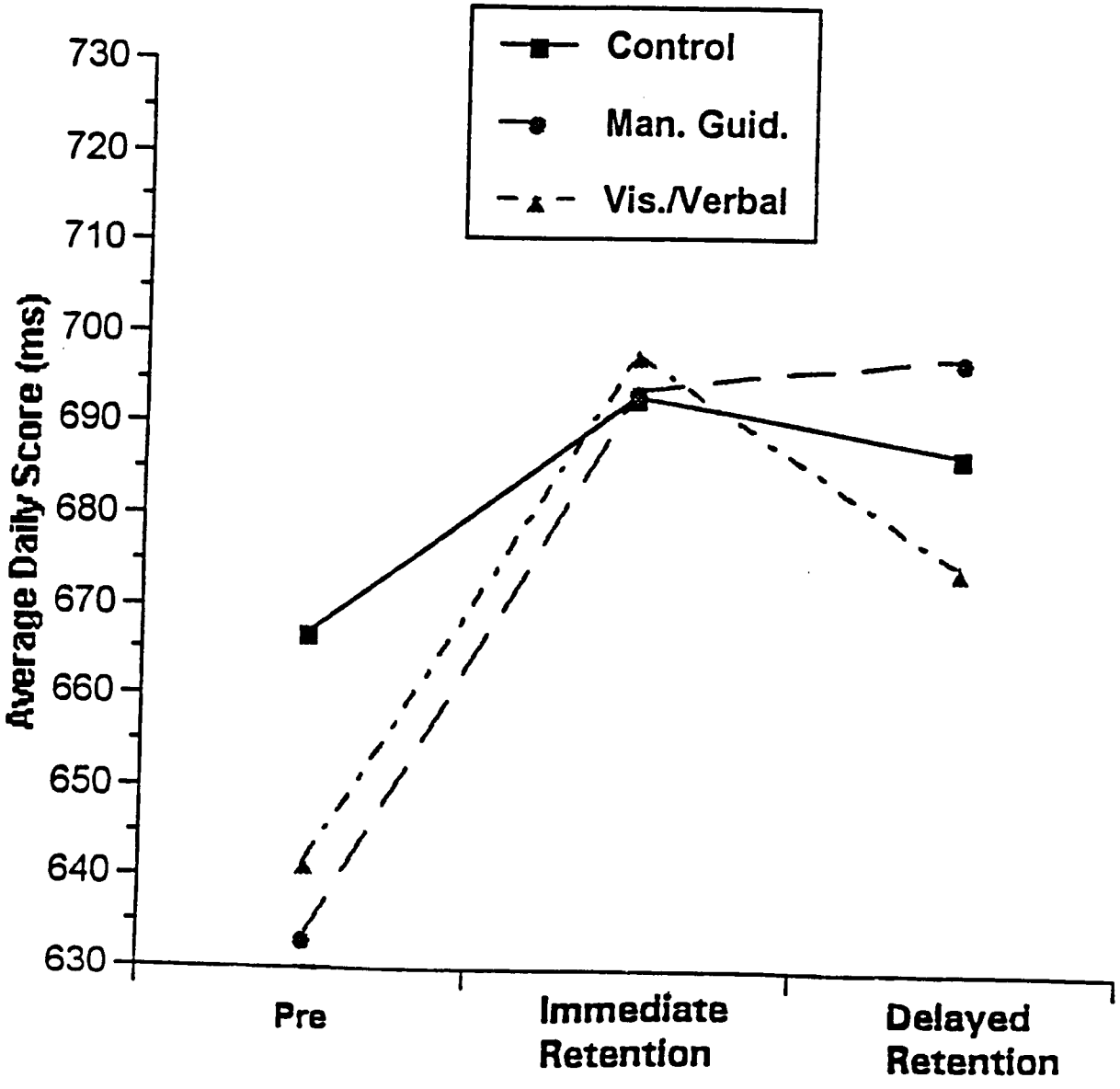
*Scores are in ms

APPENDIX C

FIGURE

A COMPARISON OF GROUP MEANS FOR PRE-TEST, IMMEDIATE RETENTION TEST AND DELAYED RETENTION TEST

Comparison of Group Means



VITA

Renae' Burnum Wallace was born in Hodge, Louisiana, on January 27, 1953. She attended elementary, junior high and high school in Jonesboro, Louisiana and is a 1971 graduate of Jonesboro-Hodge High school. She received her Bachelor of Science degree in 1974 and her Master's degree in 1982 from Louisiana Tech University. Both degrees were in physical education with an emphasis in adapted physical education.

Ms. Wallace taught fifteen years of elmentary and secondary physical education in Caddo and St. Tammany Parishes in Louisiana. Six of those years were teaching adapted physical education to students with mental and physical disabilities. Her primary area of interest was that of three through five year old developmentally delayed children.

In the fall of 1990 she accepted a graduate teaching assistantship at the University of Tennessee and began study toward a Doctor of Education degree with a major in Adapted Physical Education and a minor in Special Education Early Childhood Intervention. She received the Doctor of Education degree in August, 1993.

Ms. Wallace accepted an instructor position at Southeastern Louisiana University in Hammond, Louisiana, in August, 1992. She now resides with her husband and daughter in Mandeville, Louisiana.