

A STUDY OF CROSS-AGE TUMBLING TEACHING
TO FIRST GRADE STUDENTS

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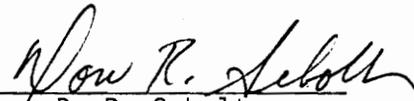
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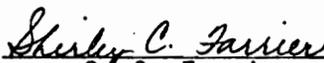
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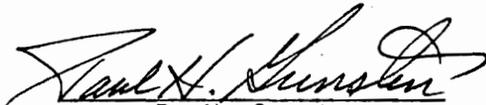
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Chapter I

INTRODUCTION

Present educational trends stress the basic concepts of individualized attention, student involvement, and humanized instruction (Gage, 1975). There are those who argue that the implementation of these concepts would eliminate some of the barriers to student motivation and facilitate student development (Glasser, 1969; Davitz, 1970). However, it appears that the biggest problem facing educators attempting individualized instruction in the United States is the vast numbers of students which result from a system which stresses an education for all children. Lippitt (1965) has written that the parents and educators in our society today have been given the major responsibility of aiding children in the development of the skills, attitudes, and values required for living a successful life. She stated that, "This model of a few adults and teachers working with, and being responsible for, such a complex learning program presents serious difficulties." As she further elaborated, individualized attention for each child would be greatly restricted by the size difference between the small group of adults and the much larger contingency of youngsters.

Therefore, if the teacher cannot adequately meet each individual's need for guidance and attention during the school day, additional avenues of support need to be explored. One possible solution

has been suggested by Lippitt (1965) and that is the utilization of the cross-age relationship between children which she referred to as a "powerful potential educational resource." Recent studies have indicated several advantages of utilizing older children, instead of adults, to work with younger children on an individual basis.

In the areas of oral reading, comprehension skills, and vocabulary acquisition, Thomas (1970) found that college tutors directed second grade tutees into more inappropriate levels of material than did sixth grade tutors. He surmised that this may likely have been due to a more realistic expectation of the capabilities of the younger child by his slightly older tutoring peer. Additionally, it was discovered that the tutees tended to express their feelings more to the sixth grade tutors than to tutors of college age. Thomas suggested that this may have been due to the ability of the sixth grade tutor to communicate on the younger child's level. Furthermore, there was the possibility that the sixth grade tutor may have been viewed as less of an "authority figure" than the adult tutor. Regardless of the explanation, such data suggest the potential of using student tutors as a supplement to the instruction given by the regular classroom teacher.

A number of studies investigating the effects of tutoring on learning have been conducted in such basic skill areas as reading (Bourg, 1973; M. Johnson, 1969; D. Robertson, 1971) and mathematics (Asper, 1973; DeCicco, 1974; Milne, 1970). Findings of these studies indicate that some students benefit from tutoring and some do not

benefit. Not only have the studies investigated the effects of tutoring on learning but they have, also, been concerned with the effects of different factors, such as tutee sex, tutor sex, tutor age, race, and others, on the tutoring situation. But, the elementary school physical education classroom, which appears to afford an ideal environment for cross-age tutoring, has been neglected by investigators in the tutoring area. Moreover, the bulk of studies conducted to date have employed a one to one tutoring relationship. In light of the large number of students in many of today's classrooms such a situation appears somewhat unrealistic. Therefore, additional research is needed to determine the effectiveness of cross-age tutoring of small groups of tutees. Also, the impact of various factors, similar to those mentioned earlier, on the tutoring program needs to be investigated in the physical education setting.

STATEMENT OF THE PROBLEM

Students have been assigned to a variety of duties in physical education classes at the secondary school level. In the role of student leader, or squad leader, students have set up equipment, taken roll, and demonstrated skills (Nelson, 1962). Vodola (1964) listed several administrative advantages afforded by high school student leaders, such as freeing the instructor to give individual attention to particular students, encouraging self-motivation of students within the groups, and facilitating learning at each student's own pace. In spite of the reported success with such programs at the secondary

level (Daughtrey, 1973), there remains the question of the suitability of the cross-age tutoring system to the elementary school physical education program.

PURPOSE OF THE STUDY

The purpose of this study was to examine the results of using older students as teachers of small groups of younger students in physical education classes at the elementary school level. Also, this study was concerned with providing more information about factors which might significantly affect the cross-age teaching situation.

The specific objectives of this study were twofold. The first was to investigate the effects of tutee sex, tutor sex, tutor grade level, and tutor tumbling ability on a cross-age teaching program of selected tumbling skills to first grade students. Null hypotheses with respect to this objective were:

Hypothesis one: There will be no difference in the tumbling skill test scores of first grade boys and girls.

Hypothesis two: There will be no difference in the tumbling skill test scores of first grade students taught by a male tutor and first grade students taught by a female tutor.

Hypothesis three: There will be no difference in the tumbling skill test scores of first grade students taught by a fourth grade tutor and those taught by a sixth grade tutor.

Hypothesis four: There will be no difference in the tumbling test scores of students taught by high tumbling ability tutors and students taught by low ability tutors.

In addition, all first order interactions among these independent variables were considered.

The second objective of this study was to compare the tumbling skills of eight groups of tutored first grade students to those of a group taught by a physical education specialist. The results were examined with respect to the following null hypothesis to determine whether or not students did benefit from being in a cross-age teaching program:

Hypothesis five: There will be no difference in the tumbling skill test scores of first grade students taught by a physical education specialist and those taught by an upper grade tutor.

SIGNIFICANCE OF STUDY

Using students as teachers could prove to be quite an asset to the physical education specialist at the elementary school level. This investigator has found that in many school systems in Virginia, such as those in Norfolk, Roanoke County, Arlington County, Harrisonburg, and Rockingham County, there is less time available for elementary school physical education classes, if they even exist, than is normally found at the secondary level. Whereas, most secondary school physical education classes meet for periods ranging from fifty to sixty minutes, only thirty minutes daily for physical education activities at the elementary school level is recommended by the State Board of Education in Virginia (1953).

Physical education activities are often left to the classroom teacher not to a trained physical education teacher. But, as pointed out by Espenschade (1968), ". . . the classroom teacher has again and again been found to lack knowledge and skill in this area" Plus, in most school systems where physical education teachers are available at the elementary school level it is often not possible for all grade levels to have a class under the specialist every day (Hanson, 1969).

Therefore, if it could be proven that upper grade elementary school students were capable of being effective tutors of those students in the lower grades than the "powerful potential educational resource" that Lippitt (1965) described could be tapped in the elementary school physical education class with the possible following results: 1) pupil to teacher ratios could be greatly reduced with the addition of more "teachers"; 2) instead of one student at a time attempting a skill under the watchful eyes of one instructor, many students could be given a chance to perform under many instructors; 3) instead of one game being played by twenty participants, five games could be conducted for fifty players; and, 4) instead of no physical education class for certain grades on the day that the specialist had other grades, a team of upper grade tutors could lead classes in activities with assistance from the classroom teacher. These might prove to be some of the results from the implementation of an elementary school physical education cross-age teaching program.

DEFINITION OF TERMS

The following terms will be used throughout the present study.

Specialist: The male physical education teacher who was assigned to the elementary school selected for this study.

Tumbling Skill Test Scores: The scores which were obtained from use of the Jarvis Tumbling Test (Jarvis, 1967) for the first grade subjects; the scores were on three tumbling skills, a forward roll, headstand, and cartwheel.

Tutees: The first grade students that were taught by the upper grade tutors.

Tutors: Those persons who were selected from the fourth and sixth grades to instruct small groups, of eight first grade students, on selected tumbling skills.

DELIMITATIONS

This study was limited to the following areas:

1. The sample of the students in this study included all of the first grade students in attendance at W. H. Keister Elementary School in Harrisonburg, Virginia, and totaled seventy-two subjects.
2. The cross-age tutors were selected from grades four and six. Eight tutors were selected from the 114 students included in the two grades.
3. The tutoring program consisted of one week for pretesting the subjects and tutors and training the tutors, six weeks for

instructing the subjects, and a final week for posttesting the subjects.

4. The test used to measure tumbling skills was the Jarvis Tumbling Test (Jarvis, 1967).

ASSUMPTIONS

1. It was assumed that the first grade subjects did not participate outside of school in activities similar to those being taught and tested in the study.

2. It was assumed that the physical education specialist was a competent instructor.

Chapter II

REVIEW OF LITERATURE

This chapter is a review of experimental studies which have examined various instructional methods in an attempt to determine their relative effectiveness in promoting learning. The review is divided into three sections. Investigations reviewed in the first section examine the results of various methods of instruction-- classroom teachers, physical education specialists, and peers. Section two describes research which has attempted to determine the effects of tutoring on the tutor and the tutee. Studies reviewed in the third section deal with the effects of different variables on the tutoring situation.

METHODS OF INSTRUCTION

Studies investigating the methods used in the instruction of elementary school children during physical education activities have generally compared the skill acquisition of students taught by the physical education specialist to that of students taught by the classroom teacher. Blalock (1971) and Workman (1965) conducted studies which compared selected motor skills of students taught by a physical education specialist to the skills of students taught by the classroom teacher in elementary school. The motor skills included a softball throw, shuttle run, vertical jump, squat thrust, and

basketball dribble. Blalock found that fourth grade female subjects (N = 98) taught by the specialist scored significantly higher on three of the five skills than their counterparts (N = 202) given instruction by the classroom teacher. Girls taught by the specialists did particularly well on the shuttle run and basketball dribble. However, males (N = 108) taught by specialists performed significantly higher on only one of the five skills tested, the shuttle run, than males (N = 201) under classroom teachers. In the Workman study, sixth grade subjects (N = 100) taught by the specialist scored significantly higher than subjects (N = 100) given instruction by the classroom teacher; females did better on all five motor skill tests administered while males performed significantly higher on three of the five tests. These findings were consistent with earlier studies (Hallstrom, 1965; Zimmerman, 1959) and suggest that a physical education specialist may be a factor in the learning of motor skills at the elementary school level, particularly for females.

Sweeney (1965) investigated the effects of various types of instruction and practice on the motor learning of elementary school children. Second, fourth, and sixth grade students were given instruction on six motor skills--overhand throwing, underhand throwing, soccer ball kicking for accuracy, catching, running, and jumping. One group received formal instruction and a pre-determined number of practice trials; the second group had the same number of trials but no formal instruction; and, a control group had neither trials nor instruction. Except for the skill of running, the instruction group performed significantly higher than the other groups on all items.

However, both groups receiving practice trials scored higher than the controls. Therefore, it appears that while instruction significantly increases skill learning, practicing a skill can, also, have a positive effect on the performance of that skill.

EFFECTS OF TUTORING

The word tutoring is normally used in education to indicate a teaching situation where there is one teacher, called a tutor, assigned to one learner, designated as the tutee. Therefore, tutoring programs can be best described as a one to one teaching situation. The benefits attributed to tutoring programs, both academic and physical education ones, include: individualization of instruction, immediate feedback, social interaction, and positive reinforcement (Erickson, 1971); the development of leadership (Salt, 1960); skill enhancement for the tutor and tutee (Schmuck, 1966); and, safety of the participants (Daughtrey, 1973; Nelson, 1966). Literature concerned with the benefits of tutoring on the tutor and tutee is reviewed in this section. Whereas, numerous studies exploring skill acquisition by the tutor and/or tutee were conducted in language arts and mathematics tutoring programs, there was an absence of research on the effectiveness of tutoring in physical education activity skills.

Language Arts

In a study of the effects had by different types of instructors on vocabulary development, Epstein (1975) divided his twenty, primary

grade level, subjects into one of four different groups. The groups were: 1) a peer tutor/tutee group in which each member was instructed by a classmate in reading skills; 2) a self-instructional group in which the student was given materials for self-teaching in reading skills; 3) a teacher-instructed group; and, 4) a blind control group. Epstein compared the results in vocabulary development of his peer tutor/tutee group to those of the other three groups. He found that the peer taught group had significantly higher scores than the other groups on a word recognition posttest. Also, the peer taught group was found to have covered significantly more words than the teacher instructed group.

Typical of the research in the language arts area was a study by Rogers (1969). She developed and evaluated a student tutoring program designed to improve the reading skills of both the tutor and the tutee. Using forty third grade children, who were experiencing difficulty in reading in the classroom, as the tutees (N = 20) and control subjects (N = 20), Rogers investigated the changes in their reading skill resulting from a tutoring program. Sixth grade students, diagnosed as underachievers by their teachers, were the tutors (N = 20) and control subjects (N = 40) in her study. The third grade tutees, who had previously experienced reading difficulty, improved significantly more on reading skills, from pre- to posttest, than did non-tutored students in the regular third grade classroom. The underachieving sixth grade tutors improved in reading skills at a rate comparable to those students in the sixth grade reading groups.

Rogers, therefore, found a reading tutorial program to be beneficial to the tutor and the tutee.

A number of other investigations have reported language arts skills improvement in tutees. Duff (1963) used third (N = 15) and fourth grade tutors (N = 15) as instructors of first (N = 15) and second grade tutees (N = 15). The first and second grade tutees had significantly higher gains in their language arts skills when compared to students that had not been tutored. Erickson's (1971) research into the effects of tutoring on reading skill had findings comparable to those found in earlier reported studies. Erickson had twelve seventh grade, male students tutor twelve third grade, male students in reading. Both, the tutors and the tutees significantly improved their reading scores from the pre- to the posttest. Frager (1969) found that kindergarten children made significant gains in reading as a result of being tutored. And, Lakin (1971) determined that the vocabulary test scores of Head-Start children who had been read to by fifth and sixth grade pupils were significantly higher than those scores of children without tutors. Likewise, Morita (1972) and Page (1975) studied the effects of tutoring on primary grade level children's reading test scores and both concluded that the children with tutors scored significantly higher on reading skill tests than those students not tutored.

Mathematics

Studies on the effects of tutoring in the mathematics area had comparable findings to the language arts realm. Ellis (1961)

analyzed the achievement gains made in sixteen high school mathematics classes. The experimental classes supplemented the regular math instructional program with tutors, whereas, the control classes did not use tutors. Three-fourths of the experimental classes made significant gains in mathematics skills over the control classes. At elementary school levels, Feldman (1975) studied the effects on mathematical skill of having fifth grade students teach first grade students. He found that the first grade tutees learned a great deal of mathematics as a result of a cross-age tutorial program. Also, working at the elementary school level, Rust (1969) determined that older students could bring about significant increases in mathematics skills of younger students through tutoring programs.

In a very thorough and definitive article entitled "The Effect of Cross-Age Tutoring on Adolescence: An Inquiry into Theoretical Assumptions," Paolitto (1976) reviewed the literature dealing with the effects of tutoring on the tutor. Her motive for placing the focus of the review on cross-age teaching's effect on the adolescent tutor was, as she explained, ". . . an attempt to redirect attention to basic theoretical questions: What is the purpose of cross-age teaching? What quality and quantity of 'effect' on adolescents is indicated by a cross-age teaching experience?" After describing the effects of various educational ideologies on the development of the tutoring process, beginning in the first century A.D., Paolitto's review progressed to the tutoring effect investigations performed in the early 1970's. As a result of her review of

the literature dealing with the effect of cross-age teaching on the adolescent tutor she concluded that:

Cross-age tutoring literature has significantly omitted any examination of the theoretical bases of prior programs. . . . This lack of theoretical assumptions led to research methodology and evaluation which was not very rigorous. . . . The nature of pre- and in-service field experience seminars for the adolescent tutors needs further consideration. . . . The selection of tutor and tutee to work together has not been adequately investigated.

Paolitto elaborated further on the last conclusion. She questioned the existence of any theoretical basis for matching sixth grade tutors with second grade tutees or eleventh grade tutors with preschoolers. And, she suggested that careful attention be given to the factors of sex, personality range, and early versus late adolescence with respect to their effect on the tutoring situation.

TUTORING RELATED VARIABLES

A number of variables having potential influence in the tutoring process have been given direct attention by a number of investigators. Such variables have included: 1) gender of tutee, tutor, and/or observers; 2) age of tutor or tutee; and, 3) knowledge and skill level of tutor or tutee. Following is a review of the research into these variables.

Gender of Tutee, Tutor, and/or Observers

Studies of the effects of gender on the acquisition of skills have taken several experimental approaches. The sex of the student being taught and whether or not it affected the learning of physical

skills has constituted one line of investigation. Johnson (1974) took the position that it was an erroneous assumption to credit girls with having better balance than boys because of the female's slightly lower center of gravity. He offered the argument that the difference in the upright position center of gravity of the two sexes was more than compensated for by the male's superior strength factor. Also, Johnson observed that the male had the strength factor plus the lower center of gravity in an inverted position. Hoffman (1955) and Smith (1956) conducted separate studies of the balancing capabilities of elementary school children. Through the use of balance board apparatus, both found the boys superior to the girls, of comparable ages, in the performance of balance skill activities. Therefore, it would appear that Johnson's argument against the superiority of the female's balance to the male's has some support from the field of research, at least at the elementary school age level.

Several investigators found the male to be superior to the female in physical skills at educational levels ranging from elementary school to college. Alderman (1968) tested sixty boys and sixty girls, ages ten through fourteen years, on an arm movement motor task. Using a rho apparatus to determine the speed in which the task was learned and performed, he studied the effects of the variables of age and sex on the task performance. Alderman concluded that the elementary school males were superior to the same age females in the performance of the task. Also, working with subjects at the elementary school level, Sweeney (1965) found the boys'

executions significantly better than the girls' on all of the skill tests conducted, overhand throwing, underhand throwing, catching, running, standing broad jump, and a soccer ball kick for accuracy. At the college level, Stovall (1966) investigated the sex differences in the learning of a complex motor task. Monitoring the subject's ability to learn to juggle three balls, she concluded that men, as a group, tended to excel the women in the learning of the motor task.

Motor skill investigations of elementary school children by Haney and by Longmuir had discrepant findings to those studies previously cited. In Haney's (1972) research, six-and-seven year old children (N = 96) rolled a ball up a board toward a target. The variables investigated included the subject's gender and the experimenter's gender. No significant difference was found between the performances of the males and the females. This lack of performance difference between sexes was, also, cited in the findings of Longmuir (1966). In a study of tumbling and gymnastics skill instruction of fifth-and-sixth grade boys and girls, he found no significant difference in the skill increases between the boys and girls. And, whereas, a difference in physical skills between boys and girls was determined by the findings of Alderman (1968) and Henry (1956), there were no sex differences associated with the rate of learning physical skills by either gender.

A second experimental approach to the study of gender has been to investigate the possible effect of gender of both the instructor and the learner on performance. Workman (1965) studied

what effect having either a classroom teacher or a physical education specialist had upon the learning of selected motor skills by sixth grade boys and girls. She found that girls taught by a specialist performed significantly higher on all five skill tests than girls instructed by the classroom teacher. Boys under the specialist, on the other hand, did better than the classroom teacher-led group on only three of the five tests. Using fourth grade boys and girls in a study similar in scope and design to Workman's, Blalock (1971) found that girls taught by a specialist performed significantly higher on three of the five tests than the classroom teacher's group of girls, whereas the boys, in similar groupings, did better on only one of the five tests. These studies suggest that females are affected more than males by the type of instructor doing the teaching, but the evidence is not conclusive.

The role of gender of tutor and tutee has also been investigated in non-motor learning situations. Ehly (1976) examined the effect of various gender combinations of tutor and tutee on language arts performance. There were three tutorial sex characteristic combinations--boy versus girl tutors, boy versus girl tutees, and same versus opposite sex tutor-tutee pairs. Sixth grade students were given daily, thirty minute tutoring sessions in spelling. Ehly found no significant differences between any of the treatment group combinations. Fitz-Gibbon (1975), following his study of the effect of ninth grade tutors on fourth grade tutees' math scores, and Brantley (1970), after conducting research on Head Start children who were

tutored by older sibling tutors in language skills and number concepts, both concluded that the sex of the tutor or tutee did not affect the final cognitive outcome.

Age of Tutor or Tutee

A number of investigators have attempted to determine the influence of age of tutor and/or tutee on performance in the tutoring situation. The bulk of the evidence seems to suggest that the rate of learning of physical skills by the student is not related to age. Alderman (1968) tested boys and girls ranging in age from ten to fourteen to determine any age differences in the learning and performing of an arm movement speed motor task. Whereas, fourteen-year-old subjects performed better than ten-year-old subjects, there were no age differences in the amount of learning by each age group. Henry (1956), similarly involved in the study of age effects on the rate of learning, had findings that agreed with those of Alderman. Bachman (1961) concluded from his study of the results of two measures of balance coordination that the rate of learning in large muscle skills was independent of age over the range of six to twenty-six years.

However, the studies previously discussed did not vary the age of the instructor. More recently this issue has been investigated by several researchers. Thomas (1970) compared the effects of college age tutors to those of sixth grade tutors on the oral reading skills, comprehension skills, and vocabulary acquisition of second grade tutees. He found no difference in the performance of second grade tutees taught by sixth grade tutors and those tutored by college

tutors. However, Thomas reported that the elementary grade tutors seemed to be more direct, with a greater use of visual and kinetic modalities, with the tutees. The college age tutors were more task oriented and tended to push the tutees through materials of inappropriate levels. In a similar study, Page (1975) compared the sight word skill performance of primary students taught by primary grade tutors to that of students assisted by upper grade tutors. Page, furthermore, compared the two tutee groups' performance to those of a third, control group, which received no assistance from tutors. The tutees made significant gains in word skill over the non-tutees. And, the primary grade tutors' students did as well as those with upper grade level tutors.

Skill Level and Knowledge of Tutor/Tutee

Two related variables having potential for influence in the tutoring situation are skill level and knowledge of the tutor and/or tutee. Love (1967) investigated the performance of fourth, fifth, and sixth grade students in throwing darts at a moving target under four conditions of instruction. One treatment group was given instruction on the principle involved in the skill performance as well as a cue indicating when to throw the dart at the target. Group two received instruction on the principle but no movement cue. Instruction on the skill principle was eliminated for the third treatment group but they were given the movement cue. The fourth group of subjects received neither the principle instruction nor the movement cue. Love found that instruction on the principle of the skill did not

improve the learning of the skill and that the skill level of the students, as indicated by the pretest, was the only source of significant variance in the different groups' final scores on the dart throwing test.

The importance of knowledge of the mechanical principles of skills to the teaching or learning of the skills, or similar type skills, has been the focus of several other investigations. Toth (1968) taught gymnastic skills on the parallel bars, side horse, and still rings to beginning collegiate gymnasts. One group's instruction included the mechanical principles of the moves to be learned, whereas, the principles were omitted from the other group's lessons. There was no evidence that the teaching of principles facilitated the learning of the skills. Girardin (1967), also, worked with college males in eleven specific tumbling skills. He discovered that the higher skilled tumblers could diagnose errors in the performances of other gymnasts better than tumblers of less ability. But, Girardin found that knowledge of the mechanics of the eleven tumbling skills was not related to the ability to perform the skills correctly.

Research at the elementary school level on mechanical principles had similar findings to those studies at the college level. In the previously cited study by Love (1967), concerned with dart throwing at a moving target by fourth, fifth, and sixth grade students, the two groups which were taught the mechanical principle of the skill did not have any more success at hitting the target than the two groups which were not instructed. Likewise, Graves (1962) found

that when second, fourth, and sixth grade students were taught the principles of foot force, involved in the ball throw for distance, they did not throw significantly further than those without any such knowledge. Colville (1957) discovered evidence that instruction of the mechanical principles of a skill did not facilitate the initial learning of the skill anymore than equal time spent practicing. Working with the skills of ball rolling, ball catching, and archery, Colville further determined that knowledge of mechanical principles did not aid in the learning of a similar or more complicated skill. Although knowledge of mechanical principles may not be of value in the learning of a skill, it may be beneficial in the teaching of the skill.

It might appear logical that the ability of a tutor to perform or demonstrate a skill would enhance his/her ability to teach the tutee. But, findings in the non-motor learning area of mathematics and language arts showed mixed effects resulting from the influence of tutor ability levels. Brantley (1970) found a relationship between the achievement level of the tutor and the scores of the tutees, whereas, three researchers (Conrad, 1976; Fitz-Gibbon, 1975; Frager, 1969) found the low ability tutor to be just as effective as those of high ability in teaching mathematics and language arts.

SUMMARY

The literature review was divided into three sections:

1) methods of instruction; 2) effects of tutoring; and, 3) tutoring

related variables. Whereas, the use of squad leaders and student demonstrators is widely advocated by physical education leaders, no research was found in this review which dealt with any type of study into the effectiveness of physical education tutorial programs. A large number of studies concerned with tutorial programs have been conducted in the areas of language arts and mathematics. These studies have concluded that some children can benefit from tutoring programs. It appears that a real need exists in physical education for more information on the possible benefits of using tutors.

More information was, also, needed to fill some of the gaps which existed in the previous research findings. Several studies concluded that females derived greater benefits from physical education specialists than did the males. It was not known if this would carry over into a tutoring program; whether or not it would be better to leave girl students with the regular physical education specialist or have them instructed by upper grade tutors was not known. And, whereas investigations into the effect of tutor and/or tutee gender, in non-motor areas, discovered little relationship between tutor effectiveness and gender it could not be surmised that the same was true for physical education activities. More facts were needed before any definite statements could be made about the effect of gender on tutoring situations in physical education. A need for more facts existed with respect to the variable of age. Motor performance investigations into the effects of age of the learner on motor skill acquisition found no real differences in the learning rates of

divergent age groups. However, these studies did not vary the age of the instructor thereby, creating a gap in the information on this facet of tutoring.

Another factor which was investigated for possible effect on the tutoring situation was the tutor's ability. Whereas the literature review led to the conclusion that knowing the mechanical principles of a skill did not aid in the learning of the skill, no evidence was given as to the value of this knowledge to the teaching, not to the performing, of the skill. Nor, did the review of literature result in any conclusive findings regarding the relationship of tutor skill to tutor teaching effectiveness in physical education. It should be determined whether or not a high skill level was a prerequisite for becoming an effective tutor. This study attempted to provide some of the information that was lacking with regard to tutoring in the physical education discipline.

Chapter III

PROCEDURES

The purpose of this chapter will be to describe the methods and procedures which were employed in the present study. Specific topics include: 1) sample; 2) evaluation instrument; 3) subject pretests and posttests; 4) tutor pretests and selection; and, 5) the tumbling skill tutorial program. Following will be a description of each topic.

SAMPLE

The sample for this study was comprised of first grade students from W. H. Keister Elementary School in Harrisonburg, Virginia. The vast majority of these students had attended this school the previous year. W. H. Keister accommodates students from middle to high socio-economic backgrounds. Seventy-two subjects were divided according to sex into two equal groups of thirty-six. The subjects in each group were numbered from one to thirty-six and assigned to one of nine treatment groups through the use of a random numbers table (Kerlinger, 1973). Experimental groups were instructed either by one of the eight upper grade tutors or by the physical education specialist and contained four males and four females each.

The nine treatment groups were randomly assigned to the nine instructors. The random assignments were as follows:

- 1) Group one to the male fourth grade tutor of high tumbling ability;
- 2) Group two to the specialist;
- 3) Group three to the male fourth grade tutor of low ability;
- 4) Group four to the female fourth grade tutor of low ability;
- 5) Group five to the female fourth grade tutor of high ability;
- 6) Group six to the female sixth grade tutor of high ability;
- 7) Group seven to the male sixth grade tutor of low ability;
- 8) Group eight to the male sixth grade tutor of high ability; and
- 9) Group nine to the female sixth grade tutor of low ability.

EVALUATION INSTRUMENT

The skills studied in this investigation were selected from the tumbling sport area. Tumbling has been described by many physical educators as a subjectively judged sport (Clarke, 1959; Edwards, 1975). Clarke attributes the scarcity of tumbling tests to this subjective nature. Hunsicker and Loken (1951) studied the objectivity of the 1950 National NCAA Gymnastics Meet and found the greatest inconsistencies in the area of tumbling ratings. Selection of a test to measure the tumbling skills in this study was based on an attempt to find an instrument which had been proven reliable in the evaluation of selected tumbling skills, particularly the forward roll, headstand, and cartwheel. Jarvis (1967) established a .98 interrater reliability score for an instrument which he had devised to measure certain physical skills, including forward roll, headstand, and cartwheel, in a study of self-instructive materials and motor skills of

fourth grade students. Selection of Jarvis' test, hereafter to be called the Jarvis Tumbling Test, was based upon its applicability to the tumbling skills selected for measurement in this study and its high interrater reliability.

The fact that Jarvis used his test with fourth grade, not first grade, subjects was not considered to be a detriment to its applicability to this study. As previously mentioned, the first grade subjects in this study had been in attendance at this school the previous year. They attended physical education classes every day under a physical education specialist. Although they did not receive instruction on the specific skills being examined in this investigation in kindergarten, they were given many opportunities to work on tumbling mats and gymnastic equipment with a great deal of instruction devoted to safety procedures. Therefore, these subjects were considered to be adequately prepared to pursue the development of the tumbling skills included in the Jarvis Tumbling Test. They were, also, considered capable of functioning safely under someone other than the physical education specialist during their physical education class.

The dependent variables of interest in this study were the posttest scores of the subjects on the three tumbling stunts previously mentioned. The selection of tumbling skills as the skills to be taught by the tutors and specialist was based on a number of factors. Several leaders in physical education (Harris, 1970; Kalakian, 1973; Keeney, 1966; Sjursen, 1967) emphasized the importance of the

individual nature of tumbling. The short or lightweight athlete is not at such a disadvantage in tumbling as in basketball or football; also stressed was the wide range of difficulty inherent in tumbling activities.

Cooper (1973) best expressed the views of physical educators on the values of tumbling thusly,

The values of tumbling in the physical education program are numerous. This type of activity challenges students to compete against themselves, as they do not have a teammate to help them maneuver their bodies through some of the intricate skills (except as a spotter). Tumbling and acrobatic skills, along with single and dual stunts, help coordination, flexibility, balance, strength, self-confidence, agility, kinesthetic perception, courage, and rhythm of timing.

Landiss' (1955) research on the influence of physical education activities on motor performance and physical fitness adds credibility to the claims for the benefits of tumbling and gymnastics. Working with male college freshmen, he found that tumbling, gymnastics, and wrestling were the most effective, of the eight activities studied, in developing motor fitness performance, as measured by the Larson Test of Motor Ability.

The tumbling skills which were taught to the first grade subjects were in the following sequence: a forward roll from a squat position to a standing position, a headstand, and a cartwheel. Skill selection was based on the skills included in several units by experts and researchers in the tumbling and gymnastics areas (Cooper, 1973; Keeney, 1966; Meyer, 1971; R. Wilson, 1966). Skill sequence was based on safety factors and the lead-up relationship of the three skills to each other. The forward roll was taught before the

headstand and cartwheel because it was considered important that the students knew how to tuck their heads, round their backs, and roll if they lost their balance while attempting the headstand or cartwheel. The headstand was taught second because the skills involved in elevating the body overhead in its performance are necessary to the performance of the lead-up activities which precede the learning of a cartwheel.

The Jarvis Tumbling Test rates the forward roll, headstand, and cartwheel on a 0-5 scale. The performer is awarded one point for each component of the skill performed correctly (Jarvis, 1967). The performers in this study could get a maximum of two points for each segment of the skill correctly performed, as the two judges ratings of the performance were combined. Therefore, the highest score possible for each skill was the total of the five segments or ten points. The three skills are similarly scored (see Appendix A).

SUBJECT PRETESTS AND POSTTESTS

All subjects were pre- and posttested using the tumbling skill tests described in the preceding section. The stunts were demonstrated by a physical education specialist, prior to each test, to all of the first grade subjects during the pretesting but not the posttesting. After the demonstration, each student, in numerical order, was given two attempts on each stunt. The stunt testing was conducted on two 5- by 10-foot tumbling mats which had been placed side by side. In order to score the performer's skill in following

a straight path as required by the forward roll and cartwheel tests, a white masking tape line was placed lengthwise through the center of one mat. Another line was placed across the middles of the two side by side mats. The intersection of the two lines was used to judge the headstand.

The performances were recorded on video cassettes by the use of a portable television camera and video cassette recorder. The equipment used was manufactured by JVC Industries Incorporated and is part of their Video Cassette Recording System CR-6300 U. Though not equipped with slow motion this camera does have stop action. The camera was placed at a point directly in line with the masking tape line running across the two mats. This placement provided a side view of both forward roll attempts, both headstand attempts, and one of the cartwheel attempts, as well as a view of the performer coming toward the camera during the second cartwheel attempt. This angle was necessary to the determination of whether or not the performer's legs and hips were coming straight over the body while attempting the cartwheel.

Two physical education specialists with backgrounds in the teaching of tumbling served as the judges for both the pre- and post-test scoring. Both specialists had worked several years with gymnastics and tumbling schools conducted at James Madison University for elementary school students. The judges individually viewed the video cassettes and, using the point criteria set up for each stunt, independently scored each subject's performances. In order to help

the judges become familiar with the testing instrument, practice scoring sessions were performed prior to the first grade subjects' pretests on a second grade class. During the practice scoring sessions, the judges scored independently of each other but then conferred to discuss what they had looked for in the performances.

After the pretests were scored, the best score of the two attempts was recorded by each judge for the five components of each skill. Then, the two judges' scores for the skill components were added together, with a resulting single pretest score for each skill component ranging from zero to two. The fifteen component scores and their three totals were recorded as the subject's tumbling skill scores (see Appendix G).

The posttesting was conducted and scored in the same manner as the pretesting. The two judges did not have copies of the subjects' pretest scores when they made their posttest evaluations. They, also, did not know the performers' treatment groups.

TUTOR PRETESTS AND SELECTIONS

Tutors were selected from the fourth and sixth grade populations of W. H. Keister Elementary School. Selection was made according to sex, grade level, and tutor tumbling ability, as determined by their pretest scores. Tutors were given the same pretest as the first grade subjects. Two tutors, a male and a female, of high ability were selected in the fourth grade. And, a male and female of low tumbling ability were chosen from the fourth grade as tutors.

Similar selections were made in the sixth grade. In addition to the three separate skill test scores, the tutors had a fourth, grand total, score which resulted from adding the three scores. On the basis of this grand total pretest score, eight tutors were selected from the 114 students in the fourth and sixth grade population. Students whose grand total scores were in the top ten percent, of each sex, at each grade level were randomly selected as tutors of high ability. Similarly, students ranked in the bottom ten percent on the tumbling skills were selected for each sex and grade combination to serve as tutors of low ability.

TUMBLING SKILL TUTORIAL PROGRAM

The tumbling skill tutorial program consisted of one week of pretesting to determine tumbling skill scores, a six-week instructional program on the three skills to be learned, and a one-week posttesting section. During the six-week instructional program, the specialist and the tutors met their respective groups three times a week for a total of eighteen teaching sessions. An equal number of days, six, were allotted to the instruction of each of the three skills. Each class meeting lasted thirty minutes and began with the subjects coming into the gymnasium as a group. Normally, two or three classes of the same grade level have physical education together. The specialist went over the lesson for the day and then the subjects divided up into their instruction groups, under either the specialist or the tutor.

In order to familiarize the tutors with the criteria for scoring the three skills, orientation sessions preceded the implementation of the study. A copy of the Jarvis Tumbling Test was given to each tutor. Information about various teacher behaviors which have been found to be effective in the teaching of tumbling and gymnastics by Garis (1966) was given to the tutors. This included information pertaining to the demonstration of the whole skill as well as critical parts, provision of adequate instruction in safety procedures, provision of an opportunity for individual instruction, and eight other instructions for effective teaching in tumbling (see Appendix B).

Before the implementation of the cross-age teaching program letters were sent to the parents explaining the program and asking for their cooperation. A letter was sent to the tutors' parents and one was sent to the first grade subjects' parents (see Appendix C).

During the six-week program, thirty minute sessions for the tutors were held each morning on the days that they were teaching. The sessions dealt with the lesson for the day, any points of information that might have needed clarification, and any problems that had been previously encountered. Lesson plans, describing the stunts to be taught, with daily approaches for teaching them over the six-week period, were provided to all of the tutors (see Appendix D).

Chapter IV

ANALYSIS AND DISCUSSION OF THE RESULTS

The purpose of the present investigation was to study the effects of a cross-age teaching program, utilizing fourth and sixth grade tutors, on the performance of three tumbling skills, forward roll, headstand, and cartwheel, by first grade students. Chapter IV, therefore, contains the statistical analysis and discussion of the results of this study. The chapter is divided into four sections. The first section discusses the preliminary findings of the study and deals with the reliability and adequacy of the data. Section two presents the analyses produced by a four-way, factorial, multi-variate analysis of covariance (MANCOVA) of the data related to the first four hypotheses stated in Chapter I. The third section discusses the results from a one-way analysis of variance for the acquisition of information relating to the fifth hypothesis.

As noted previously in this chapter, the first section deals with findings of the data collected during the investigation. The data collected during the experimental period are presented in Appendix E.

RELIABILITY AND ADEQUACY OF THE DATA

The data used to test the five hypotheses were the scores obtained from the pretest and posttest application of the Jarvis

Tumbling Test (1967) to the 72 first grade boys and girls in the nine treatment groups of this study. These scores were recorded independently on a score sheet by two judges that rated the performers' skill attempts (see Appendix F). As evidenced by the high interrater correlations, ranging from .84 to .94 on the three tumbling skills judged, presented in Table 1, both judges were highly consistent in their evaluations of the first grade students' performances of these skills.

The two judges' ratings were combined into single scores for each of the three tumbling skills (see Appendix G). Each skill contained five components. The homogeneity, or scalability, of the five components to the total skill score was determined through the use of the Kuder-Richardson formula 20. Data in Table 1 show Kuder-Richardson formula 20 reliability coefficients for the skill components ranging from a low of .51 for the posttest forward roll score to a high coefficient of .91 for the pretest headstand score. As a result of these coefficients, the skill components were determined to be homogeneous and accurate measurements of similar characteristics in the subjects performing them. The five component scores were added together, thereby, resulting in a single score for each tumbling skill measured. Each subject had three skill pretest scores and three skill posttest scores (see Appendix H).

The groups' pre- and posttest means and mean differences are shown in Table 2. For all subjects, the test score increase percentages from pre- to posttest were 38 percent for the forward roll,

Table 1

Reliability of the Tumbling Test Scores

		Interrater Correlations	Kuder-Richardson Formula 20
Pretest	Forward Roll	.84	.66
	Headstand	.98	.91
	Cartwheel	.95	.86
Posttest	Forward Roll	.97	.51
	Headstand	.94	.84
	Cartwheel	.97	.66

Table 2

Pre- and Posttest Means, Mean Differences,
and Percent of Change

	N	Pretest Mean	Posttest Mean	Mean Difference	Percent of Change
Forward Roll	72	5.72	7.88	+2.16	+38%
Headstand	72	1.04	2.67	+1.61	+155%
Cartwheel	72	1.71	5.29	+3.58	+209%

155 percent for the headstand, and 209 percent for the cartwheel. As can be seen by the group mean differences and percentages of increase, a six-week instructional program in tumbling skills can increase proficiency in performing the skills, with some increases more pronounced than others. There were substantial increases in the mean scores of all three skills.

FOUR-WAY FACTORIAL MULTIVARIATE ANALYSIS OF COVARIANCE OF THE DATA RELATED TO HYPOTHESES ONE THROUGH FOUR

This section of Chapter IV is a presentation of the findings dealing with hypotheses one through four. The data used were the three pretest and posttest tumbling skill scores of the eight tutor treatment groups. The data were subjected to a four-way MANCOVA using the .05 level for significance. This treatment was selected to adjust the posttest results for any differences in the pretest performances of the subjects as provided by the computer program written by Clyde, Cramer, and Sherrin (1971). The four factors investigated and their designations were: 1) First grade subject sex (S); 2) Tutor sex (T); 3) Tutor grade level (G); and, 4) Tutor tumbling ability (A). Statistical treatments were applied to determine what effects these four factors might have had upon the covariates. In addition, the factors' first order interactions were similarly treated to determine the significance of their effects.

As mentioned earlier in this chapter, it was determined through the use of the Kuder-Richardson formula 20 that the five

individual components of each of the skills were scalable, therefore the total pretest scores for each of the three tumbling skills were selected as the covariates. These three scores were determined to have met the requirements of statistical adequacy for covariates as they were found to be linearly independent and substantially correlated with the criteria, the three posttest scores.

Presented in Table 3 are the comparisons of the pretest mean scores, the covariates, and the posttest mean scores, the criteria, for each skill of each treatment group and the mean gain score for each skill of each group. As can be seen in Table 3, the subjects in the four factorial treatment groups made increases in test scores on all three skills. The smallest change in test score from pre- to posttest was the headstand test mean gain of .65 points exhibited by the students under the fourth grade tutors. The largest mean gain was shown by the first grade boys in their performance of a cartwheel. They increased their pretest score by 4.06 points, raising the pretest mean of .88 points to a posttest mean score of 4.94 points. The average gain in mean scores by the four factorial groups on each of the three skills was 2.15 points on the forward roll, 1.70 points on the headstand test, and 3.43 points on the cartwheel test. These gains represent skill test score increases ranging from 38 percent to 209 percent. Therefore, similar to the students in the investigations conducted in the areas of language arts (Epstein, 1975; Rogers, 1969; Duff, 1969) and mathematics (Ellis, 1971; Feldman, 1975; Rust,

Table 3

Test Means and Mean Differences Between the Treatment Groups'
Pre- and Posttest Scores and Between the Factorial Levels

Skills		Tutee Sex			Tutor Sex			Tutor Grade Level			Tutor Tumbling Ability		
		M	F	Diff	M	F	Diff	4	6	Diff	Lo	Hi	Diff
Forward Roll	Pre	5.44	6.03	0.59	5.25	6.22	0.97	6.09	5.38	0.71	5.75	5.72	0.03
	Post	7.31	8.44	1.13	8.00	7.75	0.25	7.59	8.16	0.57	7.63	8.13	0.50
	Diff	1.87	2.41	0.54	2.75	1.53	1.22	1.50	2.78	1.28	1.88	2.41	0.53
Headstand	Pre	0.56	1.53	0.97	1.19	0.91	0.28	1.13	0.97	0.16	1.31	0.78	0.53
	Post	1.78	3.72	1.94	2.91	2.59	0.32	1.78	3.72	1.94	2.91	2.59	0.32
	Diff	1.22	2.19	0.97	1.72	1.68	0.04	0.65	2.75	1.78	1.60	1.81	0.21
Cartwheel	Pre	0.88	2.81	1.93	1.41	2.28	0.87	1.91	1.78	0.13	1.91	1.78	0.13
	Post	4.94	5.59	0.65	5.22	5.31	0.09	5.38	5.16	0.22	5.85	4.69	1.16
	Diff	4.06	2.78	1.28	3.81	3.03	0.78	3.47	3.38	0.09	3.94	3.91	1.03

1969) the participants in this study benefitted from being exposed to a cross-age teaching program.

In an attempt to answer the research questions raised by hypotheses one through four, MANCOVA was applied to the mean gain score differences between the four treatment groups. Studied for effect on the groups' scores were the four factors of subject sex, tutor sex, tutor grade level, and tutor tumbling ability.

As shown in Table 4, three of the four factors, as well as all of their first order interactions, were found to have no significant effect on the tumbling test score gains of the first grade students. Therefore, hypotheses one, two, and four were not rejected. These findings on the effects of tutee sex, tutor sex, tutor ability, and their first order interactions were similar to what had been found in studies carried out earlier in physical education, as well as in disciplines other than physical education.

With respect to the effect of tutee sex on skill gains, the findings here agreed with those of Haney (1972) and Longmuir (1966). Haney worked with six and seven year old children on a ball manipulation skill and Longmuir studied the tumbling skill acquisition of fifth and sixth grade boys and girls. Both researchers concluded, as did this study, that there were no significant effects exerted by tutee sex on skill acquisition.

Similar to the effects of tutee sex, tutor sex was found to have no significant effect on the tutee's performances. This agrees with the findings of the studies conducted by Ehly (1976) in language

Table 4

MANCOVA Treatment of Four Factors' Effects
on Mean Gains of Tumbling Tests

N = 64, df = 3, 43

Factors Analyzed	F Ratios	P
S	1.78	0.16
T	0.63	.60
G	7.13*	.0005
A	1.73	.18
ST	0.56	.64
SG	0.99	.41
SA	0.93	.43
TG	1.77	.17
TA	1.31	.28
GA	0.03	.99
STG	0.87	.46
STA	0.07	.98
SGA	0.36	.78
TGA	0.96	.42
STGA	2.65	.06

*F ratio significant at the .05 level.

S = Tutee sex; T = Tutor sex;
 G = Tutor grade level, either fourth or sixth;
 A = Tutor tumbling ability, either low or high.

arts and by Fitz-Gibbon (1975) in mathematics.

Whereas, findings, cited in the literature review, showed mixed effects resulting from the influence of tutor ability on non-motor skills, it was very clear in this study that tutor ability, factor T, had no significant effect on the subjects' tumbling test scores. This study's finding is in agreement with the majority of the research results discussed previously in Chapter II and may tend to indicate that a tutor can have an understanding of a physical skill that allows the teaching of the skill but not the performance of it.

The only factor shown in Table 4 to have had a significant effect on the first grade students' tumbling test score gains was factor G, the tutor's grade level. The mean test score gains shown in the Treatment Difference column under factor G in Table 3 add up to a total point gain for the three skills of 5.68 points for the subjects under the fourth grade tutors and 8.96 points for those in the sixth grade tutorial groups. Therefore, the groups under the sixth grade tutors had a mean gain total for the three skills that was 58 percent higher than the mean gain shown by those groups under the fourth grade tutors. The F ratio for factor G was 7.13 which is significant at the .05 level of confidence. Therefore, hypothesis three concerning grade level effect was rejected and it was determined that the sixth grade tutors would be more effective in the teaching of selected tumbling skills to the first grade population than the fourth grade tutors.

The significantly more effective cross-age teaching performance by the sixth grade tutors, when compared to the fourth grade tutors, might be explained by Piaget's theory of cognitive development, which he divided into four stages (1950). Of importance to the explanation of the findings of this study are the third and fourth stage concepts, respectively termed the concrete operational stage and the formal operational stage. Children in the concrete operational stage usually range in age from seven to eleven years and are capable of a variety of logical operations, but only with concrete things. The fourth grade tutors in this study had an average age of nine years 11.5 months and were probably at this third stage of cognitive development.

Stage four, the formal operational stage, starts with ages eleven or twelve and continues to adulthood. With an average age of eleven years 9.7 months, the sixth grade tutors had probably reached the cognitive stage of formal operations. The characteristics normally associated with this stage of cognitive development describe the individuals at this level as being capable of: logical thinking with abstractions, drawing conclusions, applying adult logic, and flexible thinking. Individuals at this level are able to organize information in ways markedly different from the concrete operational stage. According to Paolitto (1976), it is theoretically possible for individuals at this stage to understand the complexity of the teacher's role. The cognitive capabilities exhibited by the individuals at

the formal operational stage have, also, been found to be the traits of a successful tutor.

Powell (1970) conducted a clinical study of cross-age tutoring and concluded that the successful tutors were more likely to give multiple responses and to see things in more complex, differentiated ways than the unsuccessful tutors. Therefore, it appears that the cognitive skills associated with successful tutoring are very similar to those skills which are demonstrated by individuals at the formal operational stage of cognitive development. This would tend to explain the significantly better cross-age teaching performance of the sixth grade tutor when compared to a fourth grade tutor.

As previously stated, the first order interactions between the four factors of tutee sex, tutor sex, tutor grade level, and tutor tumbling ability were found to have had no significant effect on the tutee's performances. But, even though the interaction between tutee sex and tutor sex did not significantly affect performances, there was a trend toward better performances exhibited by the first grade girls that had been taught by male sixth grade tutors when compared to the performances of the girls under the female sixth grade tutors. It was suggested in the studies, cited in the reviewed literature, performed by Workman (1965) and Blalock (1971), that females may be more affected than males by the type of instructor doing the teaching.

ONE-WAY ANALYSIS OF VARIANCE OF THE DATA
RELATED TO HYPOTHESIS FIVE

As noted previously in the discussion of reliability of the data in this chapter, a six-week tumbling instruction program did increase the tumbling skill proficiency of the involved subjects. The fifth hypothesis of this study dealt with the significance of skill difference found between the eight tutorial groups, discussed earlier in relation to hypotheses one through four, and a ninth group that was taught by a physical education specialist. The specialist had taught nine years in physical education at the elementary school level. Skill tests results of the treatment groups were analyzed to determine the relationship of the eight tutor groups' tumbling skill performances to those of the group taught by the specialist. The analysis of how the groups did against each other was made through the use of a one-way analysis of variance (ANOVA), with the level of significance at .05, followed by Duncan's Multiple Range as a post hoc test, as provided by the procedure ONEWAY in Statistical Package for the Social Sciences (Nye and others, 1975).

Presented in Tables 5 through 7 are the results of the one-way analysis of variance concerning group differences in mean gain scores for the three tumbling skills. The F ratios given in Table 5 for the forward roll and in Table 7 for the cartwheel were not significant, thereby indicating no significant performance differences on these two skills between the nine groups. As seen in Table 6,

Table 5

Oneway ANOVA for Forward Roll
Test Mean Difference

Source	df	Sum of squares	Mean squares	F ratio	F prob.
Between Groups	8	65.544	8.193	1.374	0.2255
Within Groups	63	375.776	5.965		
Total	71	441.319			

Table 6

Oneway ANOVA for Headstand
Test Mean Difference

Source	df	Sum of squares	Mean squares	F ratio	F prob.
Between Groups	8	83.536	10.442	2.355*	0.0277
Within Groups	63	279.339	4.434		
Total	71	362.875			

*Significant at .05 level.

Table 7

Oneway ANOVA for Cartwheel
Test Mean Difference

Source	df	Sum of squares	Mean squares	F ratio	F prob.
Between Groups	8	97.198	12.1498	1.910	0.0740
Within Groups	63	400.746	6.3610		
Total	71	497.944			

significant differences were found between the groups in the performance of the headstand. In order to determine which groups differed significantly on their headstand scores the Duncan post hoc test procedure was applied. The group taught by the female fourth grade tutor of high ability (group 5) was found to have a significantly higher mean test score gain on the headstand than the groups under the male fourth grade tutor of high ability, the female fourth grade tutor of low ability, both female sixth grade tutors, and the physical education specialist. Therefore, the fifth hypothesis was not rejected, indicating that the performance of students under a specialist would probably not be different from performance under tutors.

SUMMARY

The four-way factorial multivariate analysis of covariance of the data concerned with the effects of first grade tutee's sex, tutor's sex, tutor's grade level, and tutor's tumbling ability on the first grade tutee's tumbling test scores showed that the only factor which significantly affected the tumbling test scores was the tutor's grade level. The four sixth grade tutors' groups did significantly better on the tumbling tests than did the four groups which had been instructed by fourth grade tutors. Therefore, hypothesis three, which stated there would be no grade level effect, was rejected and hypotheses one, two, and four were not rejected. Also, hypothesis five, which stated that there would be no difference between the

eight tutors' groups' test scores and the physical education specialist's group's scores was not rejected following a one-way analysis of variance treatment of the data. The statistical treatment followed by Duncan's post hoc test indicated that one group had significantly higher test score gains than several of the other groups, but none of the tutors' groups had scores that were significantly lower than the specialist's group.

Chapter V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Many studies on cross-age teaching have made significant findings in language arts and mathematics, but there is a scarcity of such information in the area of physical education. This is particularly true at the elementary school level. Therefore, this study investigated a cross-age teaching program in physical education at the elementary school level. The main purposes of this study were:

1) To study the effect of selected factors, such as tutee sex, tutor sex, tutor grade level, and tutor tumbling ability, on the tutee's learning of three tumbling skills; and, 2) To compare the skill gains of those subjects taught by an upper grade tutor to the gains of those taught by a physical education specialist. The students' performances of a forward roll, headstand, and cartwheel were compared.

Seventy-two first grade students, equally divided according to sex, were the subjects. These comprised the entire first grade population at W. H. Keister Elementary School in Harrisonburg, Virginia. The subjects were pretested with the Jarvis Tumbling Test (1967) for their ability to perform a forward roll, headstand, and cartwheel. Two judges independently scored video cassettes of the pretests. The thirty-six male subjects and thirty-six female subjects were randomly assigned to nine treatment groups. One group was taught by a physical education specialist while the remaining eight groups were taught by

upper grade tutors. Upper grade tutors were randomly assigned to the groups according to the eight various combinations of the three tutor variables studied for effect; male-female, fourth-sixth grade, and low-high tumbling ability.

After the subjects, under the various instructors, had gone through a three-day-a-week tumbling program for six weeks, they were posttested with the same instrument used in the pretest. The pre- to posttest mean score changes were analyzed for significant differences by two statistical methods, a four-way, factorial MANCOVA and a one-way ANOVA. In order to investigate the effects of the four factors upon skill increase, the four-way, factorial MANCOVA was applied to the data using the .05 level of probability for significance. Factor one was tutee sex; factor two was tutor sex; factor three was tutor grade level; and, factor four was tutor tumbling ability. The covariates were the three pretest tumbling skill scores with the three posttest scores being the criteria. Analysis of the data revealed that tutor grade level had a significant effect on tutee test scores. Subjects with sixth grade tutors made significantly higher gains in test scores than those under fourth grade tutors. No significant differences were found between the scores of the other factorial groups; nor were any of the first order interactions between the four factors found to produce any significant effects on the groups' test scores. However, there was a slight tendency for first grade female subjects to perform better under male sixth grade tutors than female sixth grade tutors.

The one-way ANOVA was used to analyze data for any significant group differences in test score gains between the eight tutors' groups and one physical education specialist's group. No significant difference was found between the tutors' groups' performances and those of the specialist's group. However, the ANOVA did indicate that one of the nine groups had scores significantly higher than the other groups. Upon application of the Duncan post hoc test it was determined that the group under the female fourth grade tutor of high ability had significantly better scores than five of the remaining eight groups. The specialist's group was one of the five lower scoring groups.

CONCLUSIONS

In relation to the five pre-established research hypotheses and with due consideration to the evidence provided by this study the following conclusions appear to be warranted:

- 1) The sex of first grade students involved in the learning of a forward roll, headstand, and cartwheel, in a cross-age teaching program, does not have a significant effect on skill gain from pre- to posttest.
- 2) The sex of fourth and sixth grade tutors involved in teaching small groups of first grade students does not have a significant effect on the skill acquisition of those students.
- 3) The grade level of the tutors was found to be a significant factor in the cross-age teaching program, as those first grade

subjects with sixth grade tutors performed significantly better on the tumbling tests than similar students under the fourth grade tutors.

4) The ability of the tutor to perform the skills being taught did not have a significant effect on the test scores of the subjects, as the first grade performers under the low tumbling ability tutors had comparable test scores to those under tutors of high tumbling ability.

These conclusions on the first four hypotheses justify the recommendation that in the selection of upper grade students as tutors of lower grade students in physical education activities emphasis should be placed on the tutor's grade level. The older, adolescent student should be given top priority for selection.

5) Within a thirty minute class, three classes a week, six-week program, there was no significant difference between the test scores of first grade students taught by fourth and sixth grade tutors and similar students taught by a physical education specialist. While it is true that only one specialist instructed group was used in this study's examination of teaching effectiveness, as compared to eight tutorial groups, the findings for tutor effectiveness are considered valid in that each of the eight tutorial groups was individually found to have scored comparably to the specialist's group on the three tests.

RECOMMENDATIONS

As a result of this study, the investigator recommends consideration of the following suggestions for further research:

1. Further studies should be done in other physical education activities. Since tumbling is such an individual activity, the effectiveness of cross-age teaching in team type activities should be investigated. Pursuing this further, the first grade boy that had been willing to learn tumbling skills from an older girl might not be as eager to have a girl instruct him in some of the more 'masculine' sports, such as football.
2. Further studies should vary the grade level of the tutee as well as the tutor. Perhaps, the effective fourth or sixth grade tutor of first grade students might not be as effective with third grade students. Tutee and/or tutor sex might prove to be more significant factors as the two groups' ages became more similar. Or, it might be found that an optimal grade span between tutor and tutee exists.
3. Further studies should investigate the effects of the cross-age teaching experience on the tutor in physical education as has been done in other disciplines.
4. Further studies should vary the time span between when the specialist teaches the lesson and when the tutor teaches the same lesson. The feasibility of the specialist either preparing the tutor a day or two in advance to teach, or preparing the tutor to teach several lessons with one preparation needs to be investigated.

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APPENDIXES

APPENDIX A

Jarvis Tumbling Test

APPENDIX A

Jarvis Tumbling Test

I. Forward Roll

Description - This stunt will be done on a mat or grass. Student will start from a squat position, do one forward roll and come to a standing position. They will not be graded on whether or not they grasp their ankles.

Rules: 1. Only one trial will be allowed.

Scoring: 1 point will be given for each of the following with 5 being a perfect score.

- a) rolls in straight line; b) head tucked under;
- c) head does not touch floor; d) back rounded; and,
- e) comes to a standing position.

II. Headstand

Description - This stunt will be done on a mat or grass. Student will start from any position, tripod, knee-elbow stand, etc. They will bring feet up to a position of balance.

Rules: 1. Two trials will be allowed. Only the better one will be scored.

Scoring: 1 point will be given for the following with 5 being a perfect score.

- a) student comes to good balance for 3 or more seconds;
- b) legs are together; c) legs are straight; d) back is arched; and,
- d) hands are 6-8 inches in front of face.

III. Cartwheel

Description - This stunt will be done on the gym floor or grass, and will be performed without a running start. Students will do one cartwheel and end in a standing position.

Rules: Only one trial will be allowed.

Scoring: 1 point will be given for each of the following with 5 being a perfect score.

- a) student moves in a straight line; b) pushes off with one foot; c) hips in vertical position overhead; d) legs are straight when overhead; and,
- e) student maintains balance at end of stunt.

APPENDIX B

Effective Teacher Behaviors

APPENDIX B

Effective Teacher Behaviors*

The teacher should:

- 1) Seek feedback from students regarding what helps and does not help them learn to perform gymnastic activity skills.
- 2) Recognize that many errors in performance of gymnastic skills are related to mechanical principles underlying motor activity and that in certain instances an explanation of the basic mechanical principle(s) might be a useful teaching device.
- 3) Include sufficient and accurate technical information in her presentation of the skill so that students understand what is required for successful performance.
- 4) Clearly define key words used in the presentation of skills and in the correction of errors so that students understand the exact meaning of the most commonly used directions.
- 5) Demonstrate the whole skill as well as critical parts of the skill as an integral part of the skill presentation
- 6) Utilize motivating procedures to the extent that student performance is enhanced, but at the same time should provide opportunity for students to assume responsibility learning and for self-motivation.
- 7) Acquire sufficient knowledge about the gymnastic skills she is teaching to enable her to recognize the errors in performance most commonly made by students and to correct these errors by a variety of methods.
- 8) Provide adequate instruction in safety procedures related to specific skills, and insist that these instructions are followed by students.
- 9) Provide opportunity for individual instruction for all students as frequently as possible within the framework of the class organization.
- 10) Spot for and give appropriate manual assistance to students during their practice of gymnastic skills.
- 11) Prepare lesson plans with care and incorporate elements of effective instruction in the organization of skill practice.

*Garis (1966).

APPENDIX C

Letters to Parents

February 10, 1977

Dear Parents,

Your child has been selected to serve as a cross-age teacher to a group of first grade children in physical education. The teaching will be done three days a week for thirty minutes a day. The program will last six weeks. The purpose of the program is to study the effectiveness of using sixth and fourth grade students as teachers of small groups of younger children in physical education. Your child has accepted the responsibility of making up any class work that might be missed while participating in the program. Also, the cross-age teachers will be expected to work after school for about an hour, one day a week to prepare lessons.

Your child will be helping to increase the knowledge in the area of cross-age teaching. Hopefully, your child will, also, benefit from the experience of helping younger children. If your child has your permission to undertake this project, please sign this letter and have it returned to Mr. Grimes. Thank you for your cooperation in this matter.

Sincerely,

A handwritten signature in cursive script that reads "Don Grimes".

Don Grimes

February 15, 1977

Dear Parents,

We are going to start a project which will be concerned with studying the effectiveness of cross-age teaching in physical education classes at Keister School. Upper grade students (fourth and sixth) will work with first grade students. They will be completely supervised at all times by the two regular physical education specialists and the student teacher. The study will enable us to give more attention to each student because of the smaller teacher-pupil ratio. Also, we hope to gain more knowledge as to the effects of certain factors on the cross-age teaching process.

If you have any questions concerning this project, please contact Don Grimes at 434-6585. Thank you for your cooperation.

Sincerely,

A handwritten signature in cursive script that reads "Don Grimes".

Don Grimes

APPENDIX D

Tutors' Lesson Plans

Important:

1. Do not discuss your students with other students.
 2. Do not allow unsafe play. Warn students that do not behave. If they continue to be disruptive make them sit out. You may call on Miss Metcalf or Mrs. McDonaldson for discipline problems.
 3. Do not ridicule mistakes. Point out good parts of skill but do not skip the bad skills; explain what is incorrect.
 4. Treat the students as you would like to be treated.
-

Safety:

1. Never allow the students on the mats unless supervised by you.
 2. Always work skills on mats--no cartwheels on floor.
 3. Always work in same direction across mats.
 4. Have non-tumblers stay clear of mats.
 5. No "goofing off".
 6. Advise students to keep eyes open during skills.
-

Remember:

1. Do not play favorites. Be fair to all. Let different students demonstrate.
2. Be friendly but not "buddy buddy". It gets hard to discipline a buddy. You are the teacher!
3. You may use pictures, charts, books, film strips, student demonstrators, and other resources to teach.
4. Provide time in class to discuss the skills with the students. Test occasionally.
5. Know where the students will need spotting.
6. Emphasize correct performance.
7. Ask students if they understand what has been discussed or what is expected of them.
8. Remember the key words.
9. Demonstrate the whole skill as well as parts of the skill.

1) Rocking lead-up: Lie on back; bend knees and grab shins; place chin on chest; rock back and forth--shoulder to seat; try to rock up to feet.

2) Bridges: Make bridge facing the mat; raise the bridge high with seat leading; lower the bridge. Check for strength to lower bridge to back of head.

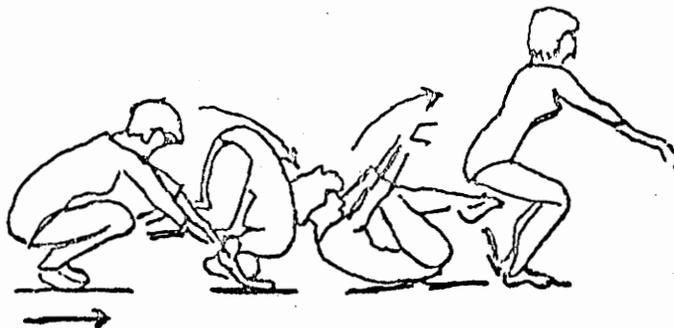
FORWARD ROLL. Start from a deep squat. Knees together. Place hands on mat about 18 inches in front of toes. Push down with feet to straighten legs and lift hips upward. Bend arms and lower upper shoulder area to mat (head tucks with the chin on chest). Stay tightly tucked--may or may not grab shins. Come to a squat position reaching forward with the hands. Do not push from mat with hands to get up.

SPOTTING. Kneel to side of performer. Place hand on back of head and neck to keep them from placing head on mat.

COMMON ERRORS. 1) Incorrect hand placement; should not be beside knees. 2) Failure to push with feet. 3) Failure to bend arms, tuck head, and place shoulders on mat. 4) Tucking head too soon (back flops on mat). 5) Using hands to get to squat position (Cooper, 1973).

Skill Test Points. a) rolls in straight line; b) head tucked under; c) head does not touch floor; d) back rounded; and, e) comes to a squat position without using hands. Student gets one point for each part of the skill that he does.

*Cooper (1973).



Be enthusiastic and confident.

Be friendly and helpful.

Provide opportunity for individual instruction as often as possible.

Wed. Feb. 16: Meet group and introduce self. Ask them their names and if they have any brothers, sisters, or friends, in your grade. Ask them what they like to do.

Stress the idea that you are going to help them learn tumbling skills and that you and they are going to have a good time.

Play some simple games: Duck, duck, goose--play sitting down; cat and mouse--stand up; and, jump the shot with a jump rope.

Thurs. Feb. 17: Re-introduce self. Ask their names again. There will be 3 groups on the mats for 15 minutes. Then they will spend time on the equipment.

On equipment: Ask them to show you what they can do.

On mats: Line up at end of mats. 1) Ask them to travel along the mats in any way that they want. TRAVEL ONE WAY.

2) Tell them to travel a different way.

3) Travel without using feet.

4) Roll like logs or pencils.

5) Travel like rabbits going backwards--stress taking weight on hands.

6) All on mats. Make selves as small as possible--stress the round feeling. Make selves long--stress the stretch.

7) Do the rocking lead-up. Stress round back and chin on chest.

Will not meet Fri. Feb. 18. Two tutors will be out of town.

Tues. Feb. 22:

- 1) Review rocking lead-up. Do them.
- 2) Make bridges and have half of the group crawl under them. Switch the groups and repeat. WATCH FOR CLOWNING AROUND.
- 3) Have entire group raise and lower bridges.
- 4) Have students roll up one mat--not too tight.
- 5) Line students up facing the rolled up mat on a flat mat;
 - a) let them cross it anyway that they want;
 - b) tell them to pick a different way;
 - c) ask them to see if they can place the back of their heads on the mat and roll across it--SPOT THEM. Try it several times.
 - d) turn mat and roll along it; if times is left do the moving wall and snake.

Wed. Feb. 23:

- 1) Have students lie on back and rock to feet. Stress:
 - a) roundness of back; and,
 - b) keeping feet close to seat.
- 2) Put folded red-white-blue mat under end of gray mat--makes a slight hill. Have student squat at top of hill; reach down the hill, put chin on chest, stress round back, do not let top of head touch mat, push with feet, bend arms, roll over to feet, and stop in a squat position. Have them get to feet without using hands pushing to get off of the mat. Spot the students. Give them several tries.
- 3) Finish with equipment work.

Thursday Feb. 24:

- 1) Refer to your forward roll sheets. Flat mat work. Students work across mats. Spot each one. Stress reaching and pushing with feet. Hands should not be put beside feet. Tell them how they will be scored: a) roll straight; b) head tucked under, chin on chest; c) head does not touch floor; d) back rounded; and, e) comes to a squat position without using hands.

Wed. March 2:

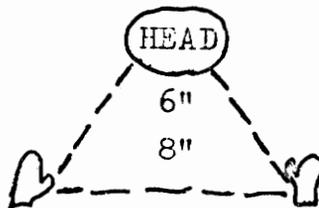
- 1) 10-15 minutes work on forward rolls. Watch each student and tell them what is right or wrong.
- 2) Last part of class have students balance on different body parts, such as: feet and hands, seat, head and feet, etc. Try shoulder stand and V-sit.

Thurs. March 3:

You do not meet classes. I'll videotape them.

Fri. March 4:

- 1) Make shapes on mats using hands, head, and feet. Stress making a good triangle.



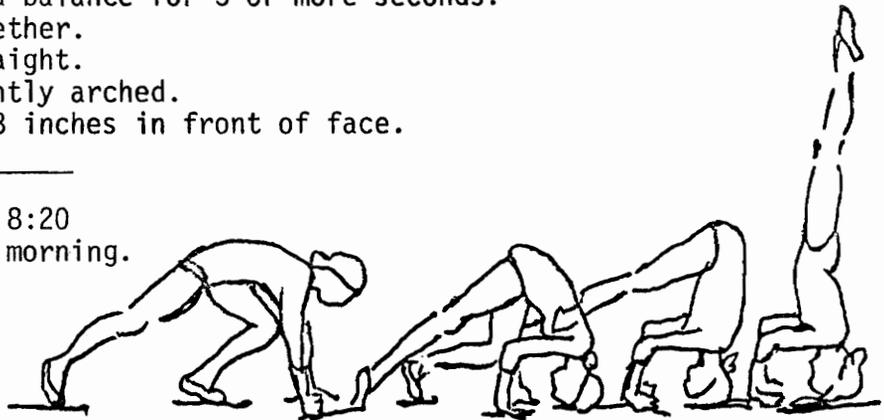
- 2) Have students make a triangle and place their knees on their elbows. This is a tripod. Place front part of head on mat--not the top of head. If they fall over, they tuck chin to chest and roll. Fingers point forward, feet point up, and lower arm points down.

HEADSTAND

Scoring: 1 point for each:

- a) Comes to good balance for 3 or more seconds.
- b) Legs are together.
- c) Legs are straight.
- d) Back is slightly arched.
- e) Hands are 6-8 inches in front of face.

We will meet at 8:20
Wed. and Fri. morning.



*Cooper (1973).

Wed. March 9:

Rug for each student. Work outside. Student places hands on corner of mat and head on top middle edge to make a good triangle.

Example:

Place knees on elbows--make a tripod. Observe and help each student.

Thurs. March 10:

Work on headstands. Errors to watch for:

- 1) Top of head on mat--should be the hairline.
- 2) Back not slightly arched.
- 3) Not keeping calf and thigh muscles tense.
- 4) Allowing arms to collapse or wobble.
- 5) Poor base of support (not a good triangle). Student may go into headstand by kicking up from mat or by extending up from tripod--watch for jerky, rapid kicks.

Fri. March 11:

Continue work on headstands. Bring paper and pencil to score the performers.

CARTWHEEL: Performed without a running start. Scoring:

- a) Student moves in a straight line.
- b) Pushes off with one foot.
- c) Hips in vertical position overhead.
- d) Legs are straight when overhead.
- e) Student maintains balance at end of stunt.

A four count skill: hand, hand, foot, foot.

Common errors: 1) Placing hands on mat at same time. 2) Placing hands to the side of the body rather than directly in front. 3) Hand too close or too far from lead foot. 4) Weak push from leg. 5) Closing legs while inverted. 6) Bending arms or legs. 7) Lead foot touches mat before lead hand leaves.

Wed. March 16:

- 1) Bunny rabbit turns. Stress straight arms.
- 2) Jump the brook with hands--keep eyes on mat, do not turn back to mat. Kick higher each time. Make brooks wider.

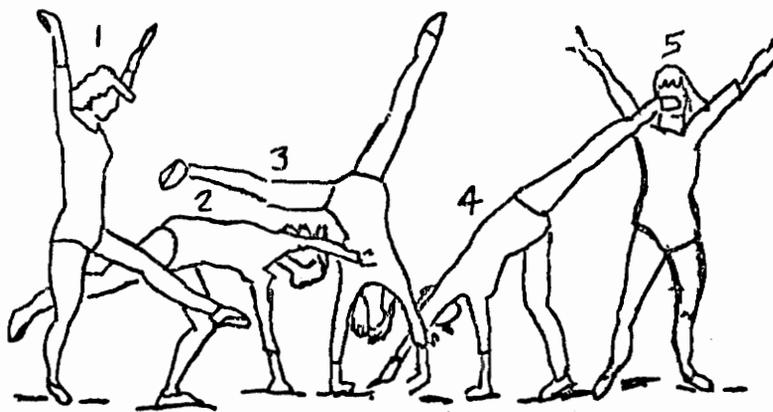
Thurs. March 17:

- 1) Students do lunge. Step out front, lean chest over bent leg.
- 2) Student places hands down and kicks up into handstand--spot students. Handstands are to teach the student to get the body overhead.

Fri. March 18, Wed. March 23, Thurs. March 24, and Fri. March 25:

Continue to work on the cartwheels stressing proper techniques.

*Cooper (1973).



APPENDIX E

Data Collected during the Experimental Period

APPENDIX E

Data Collected during the Experimental Period

Forward Roll

SS	Pretest				Posttest			
	Judge X		Judge Y		Judge X		Judge Y	
01	10000	01	00000	00	00000	00	00000	00
02	11110	04	11110	04	11110	04	11110	04
03	11110	04	11110	04	11010	03	11010	03
04	11110	04	11110	04	11111	05	11111	05
05	11100	03	11100	03	11110	04	11110	04
06	11010	03	11010	03	11110	04	11110	04
07	11000	02	10001	02	11110	04	11110	04
08	11110	04	11110	04	11110	04	11110	04
09	11010	03	11010	03	11010	03	10010	02
10	11000	02	00001	01	11110	04	11110	04
11	10000	01	10000	01	11011	04	11111	05
12	11110	04	11010	03	11110	04	11110	04
13	11110	04	11010	03	11110	04	11110	04
14	11000	02	11000	02	11010	03	11010	03
15	11110	04	11110	04	11111	05	11111	05
16	11000	02	10000	01	11111	05	11111	05
17	01010	02	01010	02	11110	04	11110	04
18	11010	03	11010	03	11110	04	11110	04
19	11110	04	11100	03	11010	03	11010	03
20	11110	04	11110	04	11110	04	11111	05
21	11110	04	11010	03	11111	05	11111	05
22	11010	03	11010	03	11011	04	11011	04
23	11110	04	11110	04	11010	03	11010	03
24	11010	03	11010	03	11110	04	11010	03
25	11110	04	11110	04	11111	05	11111	05
26	11110	04	11110	04	11111	05	11111	05
27	11011	04	11011	04	11111	05	11111	05
28	11010	03	11000	02	11111	05	11111	05
29	10001	02	10010	02	11010	03	11010	03
30	00000	00	00000	00	11010	03	11010	03
31	11100	03	11010	03	11011	04	11011	04
32	11110	04	11010	03	11001	03	10011	03
33	11110	04	11110	04	11010	03	11011	04
34	10010	02	10000	01	11011	04	11011	04
35	11110	04	11110	04	11110	04	11110	04
36	10000	01	00000	00	11010	03	11010	03
37	11011	04	11011	04	11010	03	11010	03
38	10000	01	10000	01	11111	05	11111	05

APPENDIX E (continued)

Forward Roll

SS	Pretest				Posttest			
	Judge X		Judge Y		Judge X		Judge Y	
39	10010	02	11000	02	11111	05	11111	05
40	11000	02	10010	02	11110	04	11111	05
41	11011	04	11110	04	11111	05	11111	05
42	10000	01	11000	02	11110	04	11110	04
43	11000	02	10010	02	11011	04	11011	04
44	11010	03	11010	03	11010	03	11010	03
45	11000	02	11000	02	11111	05	11111	05
46	11110	04	11110	04	11010	03	11010	03
47	11010	03	11010	03	11110	04	11110	04
48	00000	00	10000	01	11111	05	11111	05
49	11010	03	11110	04	11110	04	11110	04
50	11010	03	11010	03	11110	04	11110	04
51	11010	03	11010	03	11010	03	11010	03
52	10010	02	11010	03	11010	03	11010	03
53	10010	02	10010	02	11110	04	11110	04
54	01010	02	00010	01	01010	02	10010	02
55	11110	04	11010	03	11010	03	11110	04
56	11010	03	11010	03	11110	04	11110	04
57	10000	01	10000	01	11010	03	11010	03
58	11000	02	11000	02	11110	04	11110	04
59	10010	02	10010	02	11110	04	11110	04
60	11110	04	11110	04	11111	05	11111	05
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62	11110	04	11110	04	11111	05	11111	05
63	11010	03	11010	03	11110	04	11111	05
64	11011	04	11011	04	11110	04	11110	04
65	11110	04	11110	04	11110	04	11111	05
66	11010	03	11010	03	11010	03	11110	04
67	11110	04	11110	04	11111	05	11111	05
68	11110	04	11110	04	11111	05	11111	05
69	11111	05	11111	05	11111	05	11111	05
70	11010	03	11001	03	11111	05	11111	05
71	11110	04	11110	04	11010	03	11110	04
72	11000	02	11000	02	11010	03	11011	04

APPENDIX E (continued)

Headstand

SS	Pretest				Posttest			
	Judge X		Judge Y		Judge X		Judge Y	
01	00000	00	00000	00	00000	00	00000	00
02	00000	00	00000	00	01001	02	00001	01
03	00000	00	00000	00	00000	00	00000	00
04	00000	00	00000	00	00000	00	00000	00
05	00000	00	00000	00	00001	01	00001	01
06	00000	00	00000	00	00000	00	00000	00
07	00100	01	00100	01	01001	02	00101	02
08	00000	00	00000	00	01001	02	00000	00
09	00000	00	00000	00	00000	00	00000	00
10	00000	00	00000	00	00000	00	00000	00
11	00000	00	00000	00	00001	01	00001	01
12	00000	00	00000	00	00001	01	00001	01
13	00000	00	00000	00	00000	00	00000	00
14	00000	00	00000	00	00000	00	00000	00
15	00100	01	00100	01	00011	02	01011	03
16	00000	00	00000	00	00001	01	00001	01
17	00000	00	00000	00	00000	00	00000	00
18	00000	00	00000	00	00001	01	00001	01
19	00100	01	00100	01	00101	02	00101	02
20	00000	00	00000	00	00001	01	00001	01
21	00001	01	00100	01	00000	00	00101	02
22	00000	00	00000	00	00001	01	00000	00
23	00000	00	00000	00	00001	01	00001	01
24	00000	00	00000	00	00000	00	00000	00
25	11101	04	00011	02	11101	04	11101	04
26	00000	00	00000	00	00000	00	00000	00
27	00001	01	00001	01	11111	05	11111	05
28	11111	05	11111	05	01111	04	01111	04
29	00000	00	00000	00	00001	01	00000	00
30	00001	01	00001	01	00001	01	00001	01
31	00000	00	00000	00	00101	02	01001	02
32	00000	00	00000	00	00001	01	00001	01
33	00000	00	00000	00	00000	00	00000	00
34	00000	00	00000	00	00000	00	00001	01
35	00000	00	00000	00	00001	01	00000	00
36	00000	00	00000	00	00001	01	00001	01
37	00000	00	00000	00	01111	04	01111	04
38	00101	01	00101	02	11111	05	11111	05
39	00001	01	00000	00	00000	00	00000	00
40	00100	01	00100	01	00001	01	01001	02

APPENDIX E (continued)

Headstand

SS	Pretest				Posttest			
	Judge X		Judge Y		Judge X		Judge Y	
41	00000	00	00000	00	00001	01	00001	01
42	00000	00	00000	00	01101	03	01101	03
43	00000	00	00000	00	00001	01	00101	02
44	00000	00	00000	00	00001	01	00001	01
45	00000	00	00000	00	01101	03	01101	03
46	00000	00	00000	00	01111	04	01111	04
47	00000	00	00000	00	00001	01	00001	01
48	00000	00	00000	00	01101	03	01101	03
49	00000	00	00000	00	00001	01	01100	02
50	00000	00	00000	00	00000	00	00000	00
51	00000	00	00000	00	00000	00	00000	00
52	00000	00	00000	00	00000	00	00000	00
53	00000	00	00000	00	00000	00	00000	00
54	00000	00	00000	00	00000	00	00000	00
55	00000	00	00000	00	00000	00	00000	00
56	00000	00	00000	00	00000	00	00000	00
57	00000	00	00000	00	00000	00	00000	00
58	00000	00	00000	00	00001	01	00001	01
59	00000	00	00000	00	00001	01	00001	01
60	11101	04	11110	04	11101	04	11101	04
61	00000	00	00000	00	00000	00	00001	01
62	00000	00	00000	00	00001	01	01001	02
63	00000	00	00000	00	00000	00	00000	00
64	00100	04	11111	05	11111	05	11111	05
65	11111	05	11111	05	01111	04	01111	04
66	00000	00	00000	00	00000	00	00000	00
67	00001	01	00001	01	01111	04	01111	04
68	00000	00	01000	01	01001	02	01101	03
69	11111	05	11111	05	11111	05	11111	05
70	00000	00	00000	00	00000	00	00000	00
71	00000	00	00000	00	00000	00	00000	00
72	00000	00	00000	00	00001	01	00001	01

APPENDIX E (continued)

Cartwheel

SS	Pretest				Posttest			
	Judge X		Judge Y		Judge X		Judge Y	
01	00000	00	00000	00	00000	00	11001	03
02	01000	01	00000	00	11000	02	11000	02
03	00000	00	00000	00	00000	00	00000	00
04	11001	03	11001	03	11000	02	11000	02
05	00000	00	00000	00	01000	01	01000	01
06	00000	00	00000	00	11001	03	11001	03
07	00000	00	00000	00	11000	02	11000	02
08	00000	00	00000	00	11001	03	01001	02
09	00000	00	00000	00	11000	02	11001	03
10	00000	00	00000	00	11001	03	11001	03
11	00000	00	00000	00	11001	03	11001	03
12	01000	01	00000	00	01001	02	01001	02
13	11000	02	11000	02	11100	03	11100	03
14	01000	01	01000	01	11101	04	01101	03
15	01100	02	01100	02	11111	05	11111	05
16	11111	05	11111	05	11111	05	11111	05
17	00000	00	00000	00	11001	03	11001	03
18	00000	00	00000	00	00000	00	00000	00
19	01000	01	00000	00	01100	02	01100	02
20	00000	00	00000	00	01000	01	01000	01
21	00000	00	00000	00	11000	02	11000	02
22	11011	04	11011	04	11111	05	11111	05
23	11000	02	01000	01	11100	03	11100	03
24	00000	00	00000	00	01000	01	11000	02
25	11111	05	11111	05	11111	05	11111	05
26	00000	00	00000	00	01001	02	01001	02
27	01000	01	01000	01	11101	04	11101	04
28	00000	00	00000	00	01001	02	11000	02
29	00000	00	00000	00	10001	02	01001	02
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33	00000	00	00000	00	10001	02	11001	03
34	00000	00	00000	00	00000	00	00000	00
35	01000	01	01000	01	01000	01	01000	01
36	00000	00	00000	00	11001	03	11010	03
37	11100	03	11001	03	11111	05	11111	05
38	00000	00	00000	00	11000	02	11000	02
39	00000	00	00000	00	01000	01	01000	01

APPENDIX E (continued)

Cartwheel

SS	Pretest				Posttest			
	Judge X		Judge Y		Judge X		Judge Y	
40	01000	01	01000	01	01000	01	11000	02
41	11000	02	11000	02	01100	02	01100	02
42	00000	00	00000	00	11011	04	11011	04
43	11011	04	11001	03	11111	05	11111	05
44	00000	00	00000	00	01100	02	01100	02
45	00000	00	00000	00	11001	03	11001	03
46	01100	02	01100	02	11110	04	11111	05
47	00000	00	00000	00	11101	04	11101	04
48	00000	00	00000	00	11101	04	01101	03
49	01100	02	01110	03	11111	05	11111	05
50	00000	00	00000	00	10001	02	11001	03
51	00000	00	00000	00	11001	03	11001	03
52	00000	00	00000	00	11001	03	11001	03
53	00000	00	00000	00	11001	03	11001	03
54	00000	00	00000	00	11001	03	11001	03
55	00000	00	00000	00	11001	03	11001	03
56	00000	00	00000	00	11101	04	11101	04
57	00000	00	00000	00	10001	02	10001	02
58	00000	00	00000	00	00001	01	00001	01
59	00000	00	00000	00	11001	03	11001	03
60	11001	03	11001	03	11111	05	11111	05
61	00000	00	00000	00	01000	01	01000	01
62	11101	04	01101	03	01000	01	01000	01
63	00000	00	00000	00	11000	02	11000	02
64	01000	01	01000	01	01000	01	01000	01
65	11111	05	01111	04	11111	05	01111	04
66	01000	01	01000	01	01000	01	01000	01
67	01000	01	01000	01	01000	01	01000	01
68	11000	02	11000	02	11111	05	11111	05
69	11111	05	11111	05	11111	05	11111	05
70	00000	00	00000	00	11000	02	01000	01
71	00000	00	00000	00	11000	02	11000	02
72	00000	00	00000	00	01001	02	01001	02

APPENDIX F

Tumbling Score Sheet

APPENDIX G

Judges' Combined Scores

APPENDIX G

Judges' Combined Scores

SS	Pretest						Posttest					
	Forward Roll		Head-stand		Cart-wheel		Forward Roll		Head-stand		Cart-wheel	
01	10000	01	00000	00	00000	00	00000	00	00000	00	00000	00
02	22220	08	00000	00	01000	01	22220	08	01002	03	22000	04
03	22220	08	00000	00	00000	00	22020	06	00000	00	00000	00
04	22220	08	00000	00	22002	06	22222	10	00000	00	22000	04
05	22200	06	00000	00	00000	00	22220	08	00002	02	02000	02
06	22020	06	00000	00	00000	00	22220	08	00000	00	22002	06
07	21010	04	00200	02	00000	00	22220	08	00202	04	22000	04
08	22220	08	00000	00	00000	00	22220	08	00000	00	12002	05
09	22020	06	00000	00	00000	00	21020	05	00000	00	22001	05
10	11010	03	00000	00	00000	00	22220	08	00000	00	22002	06
11	20000	02	00000	00	00000	00	22122	09	00002	02	22002	06
12	22120	07	00000	00	01000	01	22220	08	00002	02	02002	04
13	22120	07	00000	00	22000	04	22220	08	00000	00	22200	06
14	22000	04	00000	00	02000	02	22020	06	00000	00	12202	07
15	22220	08	00200	02	02200	04	22222	10	01022	05	22222	10
16	21000	03	00000	00	22222	10	22222	10	00002	02	22222	10
17	02020	04	00000	00	00000	00	22220	08	00000	00	22020	06
18	22020	06	00000	00	00000	00	22220	08	00002	02	00000	00
19	22210	07	00200	02	01000	01	22020	06	00202	04	02200	04
20	22220	08	00000	00	00000	00	22221	09	00002	02	02000	02
21	22120	07	00200	02	00000	00	22222	10	00101	02	22000	04
22	22020	06	00000	00	22022	08	22022	08	00001	01	22222	10
23	22220	08	00000	00	12000	03	22020	06	00002	02	22200	06
24	22020	06	00000	00	00000	00	22120	07	00000	00	21000	03
25	22221	09	11112	06	22222	10	22222	10	22202	08	22222	10
26	22220	08	00000	00	00000	00	22222	10	00000	00	02002	04
27	22022	08	00002	02	02000	02	22222	10	22222	10	22202	08
28	22010	05	22222	10	00000	00	22222	10	02222	08	12002	05
29	10011	03	00000	00	00000	00	22020	06	00001	01	11002	04
30	00000	00	00002	02	00000	00	22020	06	00002	02	22002	06
31	22110	06	00000	00	00000	00	22022	08	01102	04	02002	04
32	22120	07	00000	00	00000	00	21012	06	00002	02	02002	04
33	22220	08	00000	00	00000	00	22021	07	00000	00	21002	05
34	20010	03	00000	00	00000	00	22022	08	00001	01	00000	00
35	22220	08	00000	00	02000	02	22220	08	00001	01	02000	02
36	00000	00	00000	00	00000	00	22020	06	00002	02	22011	06
37	22022	08	00000	00	22101	06	22020	06	02222	08	22222	10
38	20000	02	00202	04	00000	00	22222	10	22222	10	22000	04
39	21010	04	00001	01	00000	00	22222	10	00000	00	02000	02

APPENDIX G (continued)

SS	Pretest			Posttest		
	Forward Roll	Head- stand	Cart- wheel	Forward Roll	Head- stand	Cart- wheel
40	22010 05	00200 02	02000 02	22221 09	01002 03	12000 03
41	22121 08	00000 00	22000 04	22222 10	00002 02	02200 04
42	21000 03	00000 00	00000 00	22220 08	02202 06	22022 08
43	21010 04	00000 00	22012 07	22022 08	00102 03	22222 10
44	22020 06	00000 00	00000 00	22020 06	00002 02	02200 04
45	22000 04	00000 00	00000 00	22222 10	02202 06	22002 06
46	22220 08	00000 00	02200 04	22020 06	02222 08	22221 09
47	22020 06	00000 00	00000 00	22220 08	00002 02	22202 06
48	10000 01	00000 00	00000 00	22222 10	02202 06	12202 07
49	22120 07	00000 00	02210 05	22220 08	02201 05	22222 10
50	22020 06	00000 00	00000 00	22220 08	00000 00	21002 05
51	22020 06	00000 00	00000 00	22020 06	00000 00	22002 06
52	21020 05	00000 00	00000 00	22020 06	00000 00	22002 06
53	20020 04	00000 00	00000 00	22220 08	00000 00	22002 06
54	01020 03	00000 00	00000 00	11020 04	00000 00	22002 06
55	22120 07	00000 00	00000 00	22120 07	00000 00	22002 06
56	22020 06	00000 00	00000 00	22220 08	00000 00	22202 08
57	20000 02	00000 00	00000 00	22020 06	00000 00	20002 04
58	22000 04	00000 00	00000 00	22220 08	00002 02	00002 02
59	20020 04	00000 00	00000 00	22220 08	00002 02	22002 06
60	22220 08	22211 08	22001 05	22222 10	22202 08	22222 10
61	22000 04	00000 00	00000 00	22020 06	00001 01	02000 02
62	22220 08	00000 00	12202 07	22222 10	01002 03	02000 02
63	22020 06	00000 00	00000 00	22221 09	00000 00	22000 04
64	22022 08	22122 09	02000 02	22220 08	22222 10	02111 05
65	22220 08	22222 10	12222 09	22221 09	02222 08	12222 09
66	22020 06	00000 00	02000 02	22120 07	00000 00	02000 02
67	22220 08	00002 02	02000 02	22222 10	0222 08	02000 02
68	22221 09	01000 01	22000 04	22222 10	02102 05	22222 10
69	22222 10	22222 10	22222 10	22222 10	22222 10	22222 10
70	22011 06	00000 00	00000 00	22222 10	00000 00	02000 02
71	22220 08	00000 00	00000 00	22110 06	00000 00	22000 04
72	22000 04	00000 00	00000 00	22021 07	00002 02	02002 04

APPENDIX H

Three Pre- and Posttest Scores
of the Subjects

APPENDIX H

Three Pre- and Posttest Scores of the Subjects

SS	Forward Roll		Headstand		Cartwheel	
	Pre	Post	Pre	Post	Pre	Post
01	01	00	00	00	00	00
02	08	08	00	03	01	04
03	08	06	00	00	00	00
04	08	10	00	00	06	04
05	06	08	00	02	00	02
06	06	08	00	00	00	06
07	04	08	02	04	00	04
08	08	08	00	00	00	05
09	06	05	00	00	00	05
10	03	08	00	00	00	06
11	02	09	00	02	00	06
12	07	08	00	02	01	04
13	07	08	00	00	04	06
14	04	06	00	00	02	07
15	08	10	02	05	04	10
16	03	10	00	02	10	10
17	04	08	00	00	00	06
18	06	08	00	02	00	00
19	07	06	02	04	01	04
20	08	09	00	02	00	02
21	07	10	02	02	00	04
22	06	08	00	01	08	10
23	08	06	00	02	03	06
24	06	07	00	00	00	03
25	09	10	06	08	10	10
26	08	10	00	00	00	04
27	08	10	02	10	02	08
28	05	10	10	08	00	05
29	03	06	00	01	00	04
30	00	06	02	02	00	06
31	06	08	00	04	00	04
32	07	06	00	02	00	04
33	08	07	00	00	00	05
34	03	08	00	01	00	00
35	08	08	00	01	02	02
36	00	06	00	02	00	06
37	08	06	00	08	06	10
38	08	10	04	10	00	04
39	04	10	01	00	00	02
40	05	09	02	03	02	03

APPENDIX H (continued)

SS	Forward Roll		Headstand		Cartwheel	
	Pre	Post	Pre	Post	Pre	Post
41	08	10	00	02	04	04
42	03	08	00	06	00	08
43	04	08	00	03	07	10
44	06	06	00	02	00	04
45	04	10	00	06	00	06
46	08	06	00	08	04	09
47	06	08	00	02	00	06
48	01	10	00	06	00	07
49	07	08	00	05	05	10
50	06	08	00	00	00	05
51	06	06	00	00	00	06
52	05	06	00	00	00	06
53	04	08	00	00	00	06
54	03	04	00	00	00	06
55	07	07	00	00	00	06
56	06	08	00	00	00	08
57	02	06	00	00	00	04
58	04	08	00	02	00	02
59	04	08	00	02	00	06
60	08	10	08	08	05	10
61	04	06	00	01	00	02
62	08	10	00	03	07	02
63	06	09	00	00	00	04
64	08	08	09	10	02	02
65	08	09	10	08	09	09
66	06	07	00	00	02	02
67	08	10	02	08	02	02
68	09	10	01	05	04	10
69	10	10	10	10	10	10
70	06	10	00	00	00	02
71	08	06	00	00	00	04
72	04	07	00	02	00	04

VITA

I was born in Petersburg, Virginia on December 18, 1942. I attended Colonial Heights High School in Colonial Heights, Virginia and graduated in 1961, after which I attended the University of Virginia. Upon receiving my B. S. Ed. from the University of Virginia, with a major in physical education in 1967, I was the recipient of a graduate teaching assistantship in physical education at the University of Arizona. My M. Ed. from the University of Arizona was granted in 1968. In 1972, I began my graduate work on my doctorate at Virginia Polytechnic Institute and State University in educational administration and physical education. My degree requirements for the Ed. D. were completed during the fall quarter of 1977.

My teaching experience totals nine years in public elementary school physical education. All of the teaching has been done in Harrisonburg, Virginia. While teaching, I have been a member of the Harrisonburg Education Association, of which I am a past president. Simultaneously, I have belonged to the Virginia Education Association and the National Education Association. Also, I am a member of the Virginia Association of Health, Physical Education and Recreation.

I married Jean Louise Werner in 1967. We have two daughters, Heather Jean, age seven, and Britney Lynn, age three.

Donald R. Lewis

A STUDY OF CROSS-AGE TUMBLING TEACHING
TO FIRST GRADE STUDENTS

by

Donald Randolph Grimes

(ABSTRACT)

Much has been written about the potential resource that tutors might represent in our present educational system. However, very little scientific research could be found on this topic in the physical education field. This lack of evidence concerning the potential usefulness and effectiveness of tutors in physical education, particularly at the elementary school level, provided the impetus to conduct the present study.

The purposes of this study were: 1) To investigate the effects of four factors, tutee sex, tutor sex, tutor grade level, and tutor tumbling ability, on a cross-age tumbling teaching program for first grade students. In addition, all first order factor interactions were studied for effect. And, 2) To compare the skill gains of those subjects taught by an upper grade tutor, fourth and sixth, to the gains of those taught by a physical education specialist.

The data were collected during the spring of the 1976-77 academic year at W. H. Keister Elementary School in Harrisonburg, Virginia. Seventy-two first grade subjects participated in the study, with boys and girls equally represented. Eight upper grade

tutors were selected for the study according to the eight various combinations of the three tutor factors studied for effect; male-female, fourth-sixth grade, and low-high tumbling ability.

The seventy-two subjects were pretested for the ability to perform the three tumbling skills of forward roll, headstand, and cartwheel through the use of the Jarvis Tumbling Test (1967). The performances were recorded by a video cassette recorder and scored by two judges. Subjects were randomly assigned to either one of the eight tutors' groups or to the specialist's group and given instruction on the three skills three days a week for six weeks. After which, they were posttested for skill gain.

A six-week cross-age instructional program in tumbling skills was found to increase proficiency in performing the skills, with some increases more pronounced than others. For all subjects, the test score increase percentages from pre- to posttest were 38 percent for the forward roll, 155 percent for the headstand, and 209 percent for the cartwheel.

A four-way factorial MANCOVA was applied to the data in order to investigate the effects of the four factors upon mean score change from pre- to posttest, using the .05 level of confidence for significance. Factor one was tutee sex, factor two was tutor sex, factor three was tutor grade level, and factor four was tutor tumbling ability. The analysis of data revealed that the only factor to have a significant effect was tutor grade level. Those subjects with a sixth grade tutor scored significantly higher on the tests than those

with a fourth grade tutor. None of the first order interactions between the four factors produced any significant effects on the groups' test scores.

A one-way ANOVA was used to analyze data for any significant group differences in test score gains between the eight tutors' groups and one specialist's group. No significant difference was found between the tutors' groups' performances and those of the specialist's group.