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A Comparison of Selected Methods for Improving General Motor Ability, Skill and Attitudes in Gymnastics Between Selected Grade Nine Boys Physical Education Classes at Mackenzie Junior High School, Dauphin, Manitoba

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A COMPARISON OF SELECTED METHODS FOR IMPROVING GENERAL MOTOR ABILITY, SKILL AND ATTITUDES IN GYMNASTICS BETWEEN SELECTED GRADE NINE BOYS PHYSICAL EDUCATION CLASSES AT MACKENZIE JUNIOR HIGH SCHOOL, DAUPHIN, MANITOBA

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This thesis submitted by Pat I. Letain in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.

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Title A COMPARISON OF SELECTED METHODS FOR IMPROVING GENERAL MOTOR ABILITY, SKILL AND ATTITUDES IN GYMNASTICS BETWEEN SELECTED GRADE NINE BOYS PHYSICAL EDUCATION CLASSES AT MACKENZIE JUNIOR HIGH SCHOOL, DAUPHIN, MANITOBA

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ABSTRACT

The purpose of this study was to determine if grouping by general motor ability would be as efficient as grouping by a democratic method as far as motor educability, gymnastic attitude and skills were concerned.

Two classes of grade nine boys were selected according to results of the Johnson Motor Educability Test. Both classes were given a pre-test in general motor educability and gymnastic attitude.

The students participated in gymnastics three days in a six-day cycle for 40 minutes per day. A total of 12 classes of instruction were given. A gymnastic check list was used to record gymnastic skill achievement during the five weeks of instruction. Both classes were re-tested for general motor educability and gymnastic attitude at the end of the gymnastic unit.

Comparisons were made between test and re-test results within each class for motor educability and gymnastic attitude. Comparisons were also made between classes for motor educability, gymnastic attitude and skills. The mean differences of the scores were compared. The null hypothesis was assumed in analyzing the significance of the difference between means at the .05 level.

Results indicated that both classes showed improvement in general motor educability but no improvement in gymnastic attitude. There was no significant difference between both classes as far as general motor educability, gymnastic attitude and skills were concerned. It was concluded on the basis of the results that grouping by general motor ability was as effective as grouping by a democratic method.

CHAPTER I

THE PROBLEM

Introduction

Many students, as well as physical education teachers, have indicated fear or dislike for gymnastics as an activity in the regular high school physical education program. A great deal of this negative feeling might have its origins in the following factors: lack of class organization, little progression and variation and inexperienced teachers.

The writer has had an opportunity to visit many different classes. From observations it would seem gymnastics, as has been taught in some of the classes, has often been somewhat of a hit or miss effort. Lack of organization appeared to be one of the major factors which contributed to this situation.

The writer has used two methods of organizing gymnastic classes in his high school teaching experience. One method used motor educability groups and the other method employed captain select groups. Attitude and motor ability of the students seem to have improved considerably when both these techniques were used.

This study was undertaken to determine if there was marked improvement in attitude and motor ability when either of these techniques was used and if there was any significant difference

between the two groups as far as attitude towards gymnastics, motor ability and gymnastic skills.

Statement of the Problem

The purpose of this study was to determine if there was marked improvement in attitude and motor ability of two groups of boys enrolled in the regular physical education program of Mackenzie Junior High School in Dauphin, Manitoba, and to compare the attitudes, physical development and gymnastic skills of the two groups. This study attempted to ascertain attitude towards gymnastics, achievements in motor ability and gymnastic skills. Students were equalized in two classes according to motor ability. These two classes were then subdivided into teams. One class was divided according to motor ability teams. The other class was divided according to captain select teams.

Purpose of the Study

It was the desire of the writer of this study to determine:

1. If motor ability, and attitudes towards gymnastics would improve with the use of an organized program.
2. If one technique of organization would have better results than the other as far as attitudes, skill development and motor ability.

Need for the Study

The writer often has asked junior high and senior high school students, "Do you like gymnastics?" Frequently the reply has been, "Not really." Gymnastics can be one of the most challenging and interesting activities in the physical education program. It was

a major concern as to why high school students had that attitude and if something could be done to change it.

A well organized gymnastic program can improve the students' attitude toward gymnastics as well as toward the entire physical education program. Some students will have little interest in gymnastics regardless how well organized it is. However, the number, who have little interest, should not be as numerous.

A program in gymnastics at the high school level must meet certain requirements before it becomes purposeful; first, the class must be organized in some way so students are working in small social or ability groups; second, the instructor must be knowledgeable in his field; third, the program must be progressive and creative. Often, by the time students reach the latter part of junior high school, some of these requirements have been neglected. However, even after students have been exposed to a laisse-faire program somewhere along their school trail, positive gains in attitudes and ability can still occur through an organized and progressive program.

The writer has tried two different techniques of organizing gymnastics for high school classes. From observations of students' behavior, it was felt that desirable changes in attitudes and ability did occur. No measurement or comparison of either technique was ever attempted. It was, therefore, the desire of the writer to try both techniques with different groups of students who have been exposed to an indifferent gymnastic program to determine (1) if there was marked improvement in attitudes and motor ability following instruction, and (2) if there was any significant difference between both groups.

There are those who believe that, for a desirable learning environment to prevail, the best technique to employ for grouping students is according to ability while there are others who feel that the social factors are more essential. These two techniques were therefore employed and results were studied.

Delimitations of the Study

This study was limited to grade nine boys at Mackenzie Junior High School, Dauphin, Manitoba, enrolled in the required physical education program. The two classes used were selected according to the results of the Johnson Motor Ability Test. There were twenty-eight boys in one class and twenty-six in the other.

Gymnastics was the only activity taught during a five week period of time. It was the attempt of the writer to keep instruction similar in nature; however, there were some minor variations in method of instruction within the capabilities of each group.

Basic Assumptions of the Study

It was believed that ability grouping of students in the gymnastic program would have educational values that might improve attitude in gymnastics and general motor ability. It was also believed that captain select grouping of students in the gymnastic program would have educational values which would enhance desirable attitudes toward gymnastics and encourage improvement in general motor ability. It was further believed that, after five weeks instruction in gymnastics there would be little or no difference between the motor ability and captain select groups in terms of desirable attitudes

toward gymnastics, general motor ability and achievement in gymnastic skills.

Limitations of the Study

The selection and equation of both classes was based solely on a measurement of general motor educability. Measurement of motor educability was limited by factors of time, expense and size of class load, with no relationship to measurement of height, weight, and body build. The selection of teams in the motor ability class was based on selected items of the Iowa-Brace Test. Selection of teams in the captain select class was based on choices made by the captains that were chosen by the class through secret ballot. Personality variables with regard to pupil-teacher relationships were not examined in the study of attitudes.

Definitions of Terms Used in the Study

Since some of the words used in this study may hold different meanings to different individuals, the writer felt it necessary to clarify the interpretation of these terms as they related to the investigation.

Gymnastics:--Physical exercises of the vaulting, tumbling and balancing nature done on the spring board, vaulting box, tumbling mats and gymnasium floor.

Attitude:--A way of thinking, acting or feeling in relation to a specific subject.

Attitude Scale:--A scale to measure the degree of attitude upon a particular question to a specific subject.

Motor Ability:--"The ability to make muscular responses of a 'big muscle' nature, to move the whole body, to make quick and accurate movement" (Humiston, 1936).

Motor Educability:--The ability to learn a skill involving a fundamental movement of the body or part of the body.

Captain Select Class:--The class in which team members were chosen by the democratic method.

Motor Ability Class:--The class in which team members were chosen from results of selected items of the Iowa-Brace Test.

Related Literature

Attitudes

Physical educators, in general, have expressed much interest in the attitudes of students toward physical education and the factors that contributed to the formation of these attitudes. Williams (1964) expressed his concern over the individual termed the "physical education wallflower." He stated that these were the students who generally needed the activity the most. However, through medical excuses, absences, or just simply standing on the sidelines watching others play, they tended to stay in the background and remain uneducated.

Keogh (1953) studied attitudes toward physical education. He felt that physical education was an emotional experience which tended to group the students at extreme ends of the pole, either negatively or positively. This negative or positive attitude was dependent upon ability to perform successfully in activity. The highly skilled groups tended to have a good feeling toward activity, while the low groups were more critical of physical education. Keogh (1962) saw

the need for students to develop positive attitudes toward active participation in physical education so that they would seek further physical activity after leaving the program.

Many times students have tended to be extremely critical of the program through a lack of understanding as to its purpose and objectives. Miss Paulin ( ) asked a new class of fifteen year old girls to write their feelings about physical education.

Most of the comments were very much against physical education for a number of reasons. The girls seemed to be trying to convey to their new teacher that the highly skilled person made it more difficult for the others to want to get up in front of the class and perform. There appeared to be a natural shyness in girls of this age. This barrier has often led to negative emotions toward being forced to do something in front of other individuals.

Much research has been done as a secondary part of studies of motor ability on attitudes in relation to physical education. The majority of this research has taken place at the college level.

Wessell and Nelson (1964) did a study on the relationship between strength and attitudes toward physical education. The subjects for this study were divided into high, favorable attitudes and low, unfavorable attitudes toward physical education. They found that strength, among college women, was significantly related to attitudes toward physical education.

Allerdice (1963) studied the relationships between attitudes and physical fitness scores and sociometric status. She indicated that there was a direct relationship between attitudes and physical

fitness, however, only at the high level of fitness. She found no direct relationship between attitude and social status.

A close relationship has been drawn between success in physical education and healthy attitudes toward activity. Vincent (1967) studied the relationship between expressed attitudes and success in a variety of physical education activities. She found that the highest variable in relation to success was the attitude measure. Strength also showed a positive relationship in this study.

Carr (1945) did a study on the relationship between success in physical education and selected attitudes. Data were collected from 335 high school freshman girls. They were asked to check an attitude-rating scale related to physical education. It was concluded that the attitudes held by entering freshman girls do influence their success in physical education. It was shown that there was a significant difference in the attitudes related to physical education of the successful group as compared with those of the unsuccessful group. Three factors were found to be effective in determining success in physical education, namely, motor ability, attitudes, and intelligence.

Sullivan (1968) compared attitudes and general motor ability of high school sophomore girls between homogeneously grouped students of high and low motor abilities. Results indicated that all groups showed improvement in general motor ability scores. However, the low motor ability group was the only one to show significance in improvement over the control group. While there was slight improvement in the mean scores on attitude, neither experimental group showed significance in improvement over the control group.

Alden (1932) did a study on unfavorable attitudes of college girls with regard to the required program of physical education. She found the following factors contributed most to undesirable attitudes and placed them in their order of importance:

1. Inconvenience of dressing and undressing.
2. Not time enough for dressing.
3. Failure of secondary schools to develop elementary physical education beyond novice stage.
4. Time allotment too short to develop skill.
5. Required to participate in activities not interested in.
6. Different degrees of skill in class.
7. Antagonistic feeling toward required program.
8. Lack of time due to outside employment.
9. Class too large.

These factors summed up the findings of most of the studies on the development of attitudes toward physical education activities. Many researchers have expressed concern over the lack of studies that have been done to move forward constructively toward the building of positive attitudes in physical activity courses. This was not to say that all attitudes, or even a large percentage of attitudes, tipped the scales to the negative side in the area of physical education.

Stalnaker (1933) felt that attitudes may be and frequently are built on foundations of supposed or desired facts which in reality have no existence. He felt that strong attitudes, regardless of their soundness, should be given serious consideration. Wessell and Nelson (1964) felt that there was a definite need to investigate how attitudes could be changed. The success of the physical education program was found to be dependent to some extent on the development of favorable attitudes.

Some researchers, who have shown concern in this area, have studied the application of testing in attitudes toward physical education. Few instruments were available to evaluate a program on the

basis of an attitude scale. The two most common scales used in the study of attitudes toward physical education were Thurstone (1959) and Wear (1951).

Wear was one of the first to develop an attitude scale toward physical education. He based his study of attitude on a feeling of "acceptance or rejection towards some object or issue." He listed several important criteria for developing an attitude scale.

1. An attitude statement must be debatable.
2. All statements on a given issue should belong as nearly as can be judged to the same attitude variable.
3. An attitude statement must be susceptible to more than one interpretation.
4. Avoid "double barrelled" statements.
5. An attitude statement should be short.
6. Each attitude statement should be complete in directing a definite attitude to the specific issue.
7. Each attitude statement should comment on one complete thought.

Kneer (1956) later adapted Wear's Physical Education Attitude Inventory for use with high school girls and found the following results:

> Difficulty of vocabulary and wording of concepts of the short form make it unacceptable for use with high school girls.
>
> The adaptation of the WEAR PHYSICAL EDUCATION ATTITUDE INVENTORY is an acceptable, valid and reliable instrument to measure attitudes of high school girls toward physical education.
>
> Through an application of the Adapted Attitude Inventory, important information can be secured concerning achievement of outcomes through physical education which will measure the adequacy of the program.

This appeared to have been the most widely used attitude scale in physical education, both at the high school and college level.

Two different attitude scales for measuring attitudes toward physical education were also developed. One was developed by Thurstone and Chave, and the other by Likert. Adams (1963) compared Thurstone

and Chave's scale with Likert's and found each to be of satisfactory validity and reliability within the limitations of attitude testing.

There was a good deal of material on students' attitude towards physical education in general but no readings mentioned attitudes towards a specific activity within the physical education program.

Grouping

The literature contained a wealth of material which dealt with motor ability and classification of students on the college level. While some classification of students had been done on the high school level, the research was limited. However, many studies stated the need for ability and social grouping within physical education classes.

Ability Grouping

Adams (1964) did a study on ability grouping in junior high school. He noted that the students felt more at ease when they were allowed to move at a speed which suited their ability. He also found the competition was keener and the students tried harder to do well. But most important, he noted that all could get a feeling of accomplishment by performing skills designed to their own level of ability.

Feely (1961) grouped high school students at Abraham Lincoln High School in Brooklyn, New York, according to ability. He was convinced that ability grouping on the high school level was vastly unexplored. It held great prospects for all concerned in improved opportunities, enriched appreciations and many more meaningful achievements. Marked improvement was found in the pupil's interest and attitude at all levels and, in particular, at the top and the bottom levels.

Snyder (1962) felt the need for an increased emphasis on the gifted student. Special grouping would allow these students, blessed with superior bodies and outstanding motor educability, to develop to the fullest of their capabilities. Mott (1961) saw the necessity of ability, or intelligence grouping, as God's plan to "help eliminate the 'common mold' idea and put learning on a sound basis." Ability grouping was the singling out of the individual to be himself and grow with his or her own capabilities.

Broer (1954) felt that those students, who entered college with low motor ability, feelings of inadequacy in activity, and a general dislike for physical education, were unable to gain to their fullest capacity those goals necessary for the well rounded and continuous development of the individual. These girls who needed the program the most were often the ones who gained the least benefit toward total development.

A sound program of physical education must be built around objectives as they related to the students involved. Before classification could take place, it was imperative to know the direction one would be traveling. A specific set of objectives for classification of students was formulated by a Committee on Exercise and Physical Fitness of the American Medical Association (1967). They included:

1. To safeguard the health of participants.
2. To group pupils for effective learning.
3. To equalize competitive conditions.
4. To facilitate progress and achievement.

It was felt by the committee that failure to achieve these objectives would discourage the student's participation further and encourage a dislike for physical education.

Schreiber (1964) listed a series of objectives which have been used as a basis for success in secondary school programs for ability grouping.

1. To instill a good self-image in the individual.
2. To guide each pupil to a better understanding of himself and his capabilities.
3. To improve his understanding of the ways in which he can better relate to his peers and to those who represent authority.
4. To provide the direct experience with work so that the attitudes and habits needed by effective workers can be developed.
5. To develop a curriculum which will permit him to attain minimum levels of educational and vocational skills.
6. To educate him to be a functioning, participating, and contributing citizen.

These objectives related to the general objectives of education with a strong emphasis on the individual. It was likely they would be more readily reached when there was some basis for similarities within the group itself. The more variables there were present in an structional environment, the more multitudinous the task became to differentiate between the variables.

When one wishes to group by ability, two variables must be considered, motor ability and motor educability. Differentiation between these two variables has led to much discussion within the research, particularly in an attempt to separate one from another. Brace (1927) defined motor ability as: ". . . the ability which is more or less general, which is more or less inherent, and which permits an individual to learn motor skills easily and to become readily proficient in them." Humiston (1936) defined motor ability as: ". . . the ability to make muscular responses of a 'big muscle' nature, to move the whole body, to make quick and accurate movements. Most researchers tended to favor a slight distinction between motor ability and motor educability.

McCloy (1942) defined motor educability as "the ability to learn motor skills easily and well." Larson (1951) felt that motor educability tests were indicative of a correlation between a high score and the ability to learn new motor skills more rapidly. Carpenter (1943) defined motor educability as "the ability to solve motor skill coordination problems quickly."

The writer of this study agreed these two measures could be classified according to ability, innate or learned. The innate abilities tended to be derived from tests of motor ability, while the abilities which could be learned were classified as tests of motor educability.

In the measurement of abilities, it became necessary to analyze the factors which were involved in the construction of these tests. Motor ability was generally classified with skills such as speed, strength, coordination, while motor educability dealt with agility, alertness, and quickness of the body to master a skill.

Carpenter (1943) found four factors to be prevalent in the Johnson tests: (1) strength, (2) body control, (3) motor educability, and (4) locomotive strength of the arms. Anderson (1947) studied the correlation of a number of tests and of test items. She found that those variables which were most highly correlated with sports ability were the Sargent Jump and the various forms of the Brace Test and the Johnson Test. She felt that the Brace Test, with a correlation of (.706), was more of a general test of motor ability (Anderson and McCloy, 1947). The Johnson Test, with a correlation of (.678), was a test of motor educability (Anderson and McCloy, 1947). McCloy (1942) found the same results when he compared the Brace and Johnson tests. He studied motor educability to determine factors which he

considered necessary for effective motor learning. He listed the following as prerequisites:

1. Muscular strength - a desirable minimum.
2. Dynamic energy - ability to throw oneself into performance with full vigor.
3. Ability to change direction.
4. Flexibility.
5. Agility - ability to move the body rapidly.
6. Periferal vision.
7. Good vision.
8. Concentration.
9. Understanding the mechanics of the techniques of activities.
10. Absence of disturbing emotion factors (McCloy, 1942).

He further suggested sixteen factors which contributed to motor educability:

1. Insight into the nature of skill - including an understanding of the mechanics of the activity.
2. Ability to visualize spatial relationships.
3. Ability to make quick and adaptive decisions.
4. Sensory motor coordination I - coordination of eye with head, hand and foot.
5. Sensory motor coordination II - ability to adapt to weight and force.
6. Judgment of relationship of subject to external objects.
7. Accuracy of direction.
8. General kinesthetic sensitivity and control.
9. Ability to coordinate a complex unitary movement.
10. Ability to coordinate a complex series of movements.
11. Arm control.
12. Balance (including function of the semi-circular canals).
13. Timing
    A. Eye-motor timing.
    B. Feeling for duration of time.
    C. Combination of feeling for duration, plus an understanding of the mechanics of the activity.
14. Rhythm
    A. "Beat type" - ability to maintain a constant rhythm.
    B. Ability to react to rhythmical time intervals.
15. Sensory rhythm.
    A. Feeling for regularity of intervals.
    B. Harmony of rhythmical feeling.
    C. Feeling for proper timing.
    D. Feeling for stress or intensity.
16. Esthetic feeling.

McCloy's detailed list of factors involved in motor educability was indicative of a combination of many of the studies that had been carried out before and after the completion of his study.

Social Grouping

A study was made by Peggy P. Whildes (1956) comparing two methods of teaching beginning basketball, one pupil dominated, and the other teacher dominated. Two physical education classes were used as subjects. Comparison of the groups was made on the basis of group dynamics as measured by sociometric tests, the quality of performance in competition, and finally the socreboard status of the two groups when competing against each other. It was found that the pupil-dominated technique had certain advantages in terms of bringing least liked individuals into the group and in terms of improving some aspects of team performance. Frost (1947) obtained a correlation of .40 + .03 between friendship scores and teammate scores for both administrations of her tests.

Fulton (1950) stated that it would seem student choices of teammates were related somewhat to (1) friendship, as measured by stated choices of friends and (2) skill as measured by the French Volleying Test. Teammate status, as measured by student choices, is as closely related to teacher judgment of skill in volleyball as are scores on the French Volleying Test. This was particularly interesting in view of the fact that the volleying test has been considered by many to be the best available single test of volleyball skill.

Collins (1960) assigned grade 7 boys' teams according to results of a general motor capacity test and member captain select test. Apparently there was more dissatisfaction with teammates on

teams in which the students themselves had no part in the selection of player and captain than in the member selected class.

Gymnastics

Davis (1961) conducted a study in which he tried to place certain selected tumbling and balance stunts at various grade levels. Davis took into consideration the various skill levels of the children in each grade or age group. He found that at the elementary level there were no hard and fast rules as to which stunts could be learned faster at any given level. He concluded that certain students should be introduced at earlier grades and certain others at later grades as determined by the results of the test the children took.

Wickstrom (1952) studied the teaching of tumbling and gymnastics to college freshmen. He concluded the whole method was more effective than the whole direct repetitive method. At both the elementary and the intermediate levels of difficulty the whole method proved superior.

Hill (1962) made a study which was concerned with educational gymnastics. She found that progress in the child's learning of a skill or stunt was determined by the individual's innate capabilities, previous experience, stage of physical development, needs and interests.

Keeney (1966) stated that, whether one's intentions and ambitions were confined to the lower echelons of tumbling or fixed on a much higher goal in terms of skill, there has to be a beginning to the learning process and a systematic, step by step progression from one skill to another. The degree of pleasure experienced from the activity, the safety of the performer, and the steady advancement in tumbling

prowess depended upon learning each stunt and skill correctly and with fair precision.

> A good gymnastic program can solve some of the basic problems confronting physical education in schools today. First, it helps to develop a part of the body neglected by Americans--the upper arms and shoulders. Second, gymnastic units can effectively involve large classes which seem to be unavoidable. Third, gymnastic activities lend themselves admirable to different levels of ability. Students with highly developed skills can work on advanced techniques. Gymnastics add variety and challenge, zest, and fun to the physical education class (Narowetz, Leso, Vodola, Hellman, and Piscope, 1964).

Loken and Willoughby (1959) stated that a great deal was happening in gymnastics. It was being rediscovered that, with proper supervision and instruction, gymnastics could be one of the most popular and exciting activities in the school program. They also felt it was very important that the necessary progression be used in learning tumbling skills. No one learned to run before he could walk. By the same token, somersaults should not be attempted before the basic fundamentals have been successfully mastered. Too many instructors have tried to push the class too rapidly. This often results in the development of bad habits and leads to many injuries. Fundamentals cannot be stressed too heavily.

> In teaching gymnastics and tumbling, the lesson plans should proceed progressively from the simple to the complex. Progressive lead up activities should be given which contain elements identical with the desired end. Relatively complicated coordinations are part of all gymnastic feats, and in order that they may be learned correctly they should be broken down into parts and learned correctly they should be broken down into parts and learned separately.
>
> The participants should not be allowed to practice too long without some success. It seems best, then, to teach moderately easy lead ups and to provide an individual mat area (even though small) for each one or two performers. Thus the inevitable mistakes may be made without attracting undue group attention.

> Motivation through competition and exhibition stimulates interest in gymnastics and tumbling, and provides added interest to the participants. The competent performer should be encouraged to create routines that have continuity and unity instead of learning the set routines of the instructor (Price, Keeney, Giallombardo, Phillips, 1961).

A concern as to whether elementary pupils were capable of increasing their gymnastic skills in an advance program of instruction in tumbling was shown by Longmuir (1967). He concluded, on the basis of the results of the within group comparison, that selected fifth and sixth grade children were capable of increasing gymnastic skills through participation in an advanced tumbling program.

Very little information was located on research done with high school gymnastics. There was some research but it tended to be more on technique of teaching rather than on class organization.

Summary

Upon completion of a comprehensive review of the literature in the study of attitudes and attitude scales in physical education, organization and teaching technique in gymnastics, and the classification of students for physical education, the following conclusions were drawn:

1. There was a need for classifying students on the basis of some criteria for physical education activities.

2. Many investigators found that classification of students with regard to motor ability and/or motor educability had definite merit in reaching the objectives of the physical education program.

3. Some investigators found that classification of students with regard to democratic technique had definite merit in reaching the objectives of the physical education activities.

4. The study of attitudes was found to be a contributing factor in achieving success in physical education activities.

5. No study was found which dealt with grouping of students in a specific activity and its effect on attitude towards that program.

6. There was a need for more research on teaching technique and organization of gymnastic programs.

CHAPTER II

METHODOLOGY

The purpose of this study was to determine if there was marked improvement in attitude and motor ability of two classes of boys enrolled in the regular physical education program. An additional purpose was to compare the attitudes, physical ability and gymnastic skill of the two classes.

Description of Subjects

The subjects used in this study were fifty-four grade nine boys enrolled in the regular physical education program at Mackenzie Junior High School, Dauphin, Manitoba. The classes were conducted during the months of November and December of the 1971 - 1972 school year.

Motor Ability Class

Four boys' grade nine classes were given the Johnson Motor Educability Test. The two classes with the least difference in mean scores of the Johnson Test were selected for this study. One of these classes was arbitrarily chosen to be the motor ability class. Five teams were formed in the class and members of the teams were selected according to the result of selected items of the Iowa-Brace Test.

Captain Select Class

Of the two classes mentioned above, one was arbitrarily chosen to be the motor ability class and the other class was known as the -

captain select class. In the captain select class five teams were formed and members of the team were selected by captains who had been elected by the students in the class.

Statistical Procedures

The investigator assumed the null hypothesis in the analysis of difference between the means obtained on the initial test and the re-test. This hypothesis was used both in the analysis of motor ability and of attitudes. This hypothesis asserted that there was no difference between two sample populations or two mean scores, and if a difference was found, it was accidental, unimportant and probably due to a sampling error (McNemar, 1949).

There are several methods used to validate the null hypothesis. To make within group comparison of the means, the "t" technique for testing the significance of the difference between means derived from correlated scores from small samples was suitable for use in this study.

To make between group comparisons of the means, the "t" technique for testing the significance of the difference between uncorrelated means appeared most suitable in this study. This test determined the ratio between the mean difference and the sampling error of the difference. This ratio was expressed as "t" and was verified in a table of "t" (Garrett, 1968).

For this study it was decided to reject the null hypothesis at the .05 level of significance. Complete data, including mean differences and raw scores, may be found in Appendix , page . Details of the mathematical processes employed in the analysis for the testing areas may also be found in Appendix , page

Measuring Instruments, Their Application and Use

Motor Educability

The Johnson (1932) test of general motor educability was used to measure "native neuromuscular skill capacity" at the beginning and the end of the gymnastic unit. It was used for both the captain select and motor ability class. The purpose of this test was to determine if students, when grouped according to motor ability, would show greater improvement in neuromuscular skill capacity at the end of tee gymnastic unit than students who were grouped according to a democratic method.

The test included ten exercises and were performed on a tumbling mat. These test items were: (1) straddle jump, (2) stagger skip, (3) stagger jump, (4) forward skip, holding opposite foot from behind, (5) front roll, (6) jumping half turns, right and left, (7) back roll, (8) jumping half turns, right and left alternately, (9) front and back roll combinations, (10) jumping full turns. Ten points were scored for each item with a possible perfect score of 100. All exercises were to be performed with a reasonable erect posture. All jumps had to be performed with a regular rhythm at about the rate of two short jumps to the second, or five seconds for each exercise. Detailed instructions for the Johnson Test may be found in Appendix A, page 50.

Reliability and Validity

Johnson (1932) repo-ted a validity coefficient of .69 and a reliability coefficient of .97, but he did not indicate the criterion.

Gire and Espenshade (1942) reported a reliability of .61. Larson (1951) reported a validity of .69.

The selection of the use of this test for measuring improvement in native neuromuscular skills was based on the following:

1. These exercises did not involve strength, speed or endurance.

2. The exercises were foreign to any sort of natural activity, which avoided the possibility of practice prior to testing.

3. Although time consuming, the test was easy to administer and to score accurately.

4. There was a minimum of equipment necessary for administering the test.

5. Although validity and reliability coefficients were not extremely high, it was felt by the writer that this test was a capable measure of motor educability.

Administration of Test

The Johnson test was administered to the two classes. The motor ability class consisted of 28 boys and the captain select class consisted of 26 boys.

The test was administered by the writer. Each exercise was demonstrated and full instructions were given on the method of scoring. Each exercise item was scored on a 10 point basis. There was a maximum possible score of 100 points.

The Johnson test was again administered to the same two classes at the termination of the gymnastic unit. The same procedure was followed to administer this test the second time.

Attitude Toward Gymnastics

No attitude scale was found which measured attitude toward a specific physical education activity. Kneer (1956) adopted Wear's Physical Education Attitude Inventory so it could be understood and used with high school students. It was felt that most statements in Kneer's inventory could readily apply to a specific physical education activity simply by substituting the term physical education for a specific activity. The statements used in Kneer's inventory were then used and the term physical education was replaced by gymnastics. Statements 13, 15, 24 and 33 of Kneer's Inventory were omitted as they could not logically be applied to gymnastics. The 36 remaining statements were retained and used in this study for measuring grade 9 boys' attitude toward gymnastics (Appendix , page

Reliability and Validity

Kneer (1956) revised the Wear Attitude Inventory in an attempt to adapt the reading level to high school girls and to clarify statements found to be ambiguous to the girls. The correlation between these two inventories was .84.

Validating attitude inventories is a difficult task. It is the writer's opinion that since the Kneer Attitude Inventory is acceptable as a valid instrument, and the basic meaning of each statement is not changed in the gymnastic one, the modified Kneer Attitude Inventory is also valid.

To determine the reliability of the gymnastic attitude inventory a test re-test was required. A group of 50 grade 9 boys were selected for these tests. One week following the initial test they were

re-tested. No instruction in gymnastics was given during the test and re-test period. A reliability coefficient of .949 was established. Details of the mathematical process used may be found in Appendix , page

Administration of Test

The Modified Kneer's Attitude Inventory was administered to the two classes prior to the first class period of gymnastic instruction. After the test was distributed to each individual in the class, the directions were read aloud.

The same inventory was repeated to these classes at the termination of the gymnastic unit. The test was administered by the experimenter and the procedures were followed in the same manner.

Gymnastic Skills

No record had been kept of the students' previous accomplishments in gymnastics. It was assumed that both classes had achieved the same level of gymnastic skill prior to this study. This assumption was based on the fact that there was no significant difference between the two classes in regards to general motor educability. The Johnson test of general motor educability contained many gymnastic type stunts which appeared to be a fairly valid indicator of the student's gymnastic achievements.

Specific gymnastic skill accomplishments were recorded during the unit. Gymnastic skills for tumbling, long box vaulting, spring board, floor exercise and cross box vaulting were listed and score sheets for recording the specific gymnastic skills were used. Skill

charts may be found in Appendix , page . The gymnastic score sheet may be found in Appendix , page

Administration of Tests

Prior to the initial gymnastic class period the leaders of both classes were familiarized with the gymnastic score sheets and skill charts. Training sessions were held with the leaders and the instructor before every second class period. At this time specific gymnastic skills were demonstrated and check points for each skill were also noted. The students were required to meet these standards before credit was given or recorded on the score sheet. Any questions and/or problems relating to scoring, etc. were also given full attention at these sessions.

Captain and Team Selection

The motor ability class teams were chosen according to the results of 8 selected items from the Revised Iowa-Brace Test. The items in this test included: (1) Iowa Test number 8 (double-heel-click test), (2) Iowa Test number 10 (jump-foot test), (3) Iowa test number 17 (cross-leg-squat test), (4) Iowa Test number 22 (one-knee-balance test, (5) Iowa Test number 23 (one-knee-head-to-the-floor-test), (6) Iowa Test number 29 (russian-dance test), (7) Iowa Test number 30 (top test), (8) Iowa Test number 31 (single-squat balance test). The captain of each motor ability team was then elected by a majority vote by the members of his team (Appendix , page

The captain-select-class teams were chosen by the team captains who had been elected by the class.

Reliability and Validity

In a factorial analysis of the Iowa Brace Test, the following factors were identified: (1) dynamic energy, (2) flexibility, (3) balance, (4) semi-circular canal balance, (5) insight into the nature of the stunt, (6) arm control. Price, Keeney, Giallombardo and Phillips (1961) stated that power, upper body strength, muscular coordination, flexibility, balance, and agility of self confidence were essential qualities in a successful gymnast. The Iowa Brace Test seemed to include all of these qualities. Therefore, the investigator assumed the use of this test would be a valid determiner of the student's gymnastic potential.

Administration of Tests

The two tests used to select team captains and to determine team members were the captain-select test and selected items of the Iowa-Brace Test.

Captain Select Class

One week prior to the initial gymnastic class period, the students were asked to consider the five boys in class who would be good team leaders. In making their choices they were asked to consider the following qualifications of a leader: (1) good ability in physical education, (2) listens to and follows directions, (3) is prompt, (4) someone who you would like to help you in class.

The students were requested to list in order of preference the five boys in the group whom they thought would be the best leaders for gymnastics. The sheets were collected and votes were counted. A

5,4,3,2,1 scale was followed with the first name on the ballot receiving 5 points, and so on. The five students chosen were those with the highest aggregate scores.

In the next class period, the captains chose their teams from a vantage point. First choice was decided by chance. Once the captains had made one choice each, the captain who had fifth choice also had sixth. The selection of students continued in this shuttle fashion until all students had been chosen.

Motor Ability Class

Five teams were formed according to the result of selected items of the Iowa Brace Test. The test was administered to all students in this class two classes prior to the first gymnastic class period.

Students were asked to work in partners and to score each other. The importance of scoring accurately was emphasized. They were informed that the test would not be used for grading purposes.

The administrator of the test demonstrated and then observed the first and second trial of each item of the test in sequence. After each item the scores were given to the instructor who recorded them on a master score sheet.

The five teams were grouped according to the scores of the modified Iowa-Brace Test. The scores were listed progressively from highest to lowest. The five students who scored highest were on Team One, etc. The teams were not even as some scores tended to skew. The number of students on each team were: Team One - 5, Team Two - 5, Team Three - 5, Team Four - 5, Team Five - 8. The scores provided by Team One members

ranged from 12 - 14, Team Two members scores ranged from 10 - 11, Team Three members scored 9, Team Four members scored 8, Team Five members' scores ranged from 2 - 7.

The captains for each team were then elected by majority vote of the team members.

Activity Program

The students participated in gymnastics 3 days in a 6-day cycle for 40 minutes per day. Teams and captains were selected. The students were familiarized with all aspects of this study. Instruction was started the first week of November and continued for 4 cycles or 12 class periods. One week was required for retesting and completion of all aspects of the program.

The instructor met with the leaders of both classes for 30 minutes before the first gymnastic class. This same procedure was followed after every second class period. At these sessions, the instructor demonstrated skills that the students were to perform and any questions or problems pertaining to the program were considered.

The 40 minutes of activity were broken down as follows:

1. Changing--5 minutes.
2. Warm up and free practice--5 minutes.
3. Instructions and demonstration--5 minutes.
4. Practice at one area--20 minutes.
5. Changing--5 minutes.

Each team rotated to a different station each activity period but remained at that area for the entire class. The five stations

were: (1) tumbling, (2) long box vaulting, (3) spring board, (4) floor exercise, and (5) cross box vaulting.

During team practices, the instructor demonstrated, spotted and generally assisted at the various stations. The team leader recorded skill achievement for his team members.

CHAPTER III

ANALYSIS OF THE DATA

The purpose of this study was to determine whether students, grouped by ability, would improve in ability, skill and in attitude toward gymnastics more than those students grouped by a democratic method. The basis for comparison of the groups was the results obtained from the Johnson Motor-Educability Test, Modified Kneer Attitude Inventory and gymnastic skill check list.

Procedure

The tests were administered in accordance with the recommendations of Dr. LaVernia Jorgensen, Department of Physical Education, University of North Dakota and Dr. Walter Koenig, Department of Physical Education, University of North Dakota. The method and procedure used in group selection, organization and supervision of the testing have been presented in the previous chapter.

Selection of Groups

The selection of the classes was based on a measurement of innate motor ability. One class was designated as the Captain Select Class and included teams selected by a democratic technique, the Motor Ability Class included teams formed according to motor ability. Original motor ability was the equating factor used in this study.

Test Administration

All tests were administered within the facilities of the physical education department of Mackenzie Junior High School, Dauphin, Manitoba. The tests used for comparison were all given by and under the direct supervision of the investigator. The tests were given in this order:

1. Johnson Motor-Educability test given two weeks prior to gymnastic instruction.
2. The Modified Kneer Attitude Inventory given one week prior to gymnastic instruction.
3. Gymnastic skill check list used during the five weeks instructional program.
4. Re-test of the Modified Kneer Attitude Inventory given the first class following completion of the gymnastic unit.
5. Re-test of the Johnson Motor-Educability given immediately following.

Progress of the Captain Select Class

The mean of the motor ability scores of the Johnson test and the attitude score of the Modified Kneer Attitude Inventory, taken prior to the unit of instruction, were compared with those of the scores taken at the end of the instructional unit. The difference was tested by the paired "t" test, to determine if the significance of the difference between the means showed improvement in motor ability and attitude.

Progress of the Motor Ability Class

The data for the Motor Ability Class were tested in the same manner to determine if the significance of the difference between the means showed improvement in motor ability and attitude.

Comparison of the Progress of Captain Select Class and Motor Ability Class

The difference between the means derived from the correlated scores of the Captain Select Class was compared with the Motor Ability Class and the difference was tested for significance by the paired "t" test. The motor ability scores, attitude scores and gymnastic skill scores were compared by this method.

Results of Comparisons

Motor Ability

The Captain Select Class had a mean score of 46.00 in the pre-test of the Johnson Motor-Educability. This group had a mean score of 61.04 on the re-test. This represented a mean difference increase in motor ability of 15.04 points between the test and re-test. The "t" value of 7.92, with 25 degrees of freedom, indicated significance at the .05 level of confidence; therefore, the null hypothesis was rejected.

The Motor Ability Class had a mean score of 47.86 in the pre-test of the Johnson Motor-Educability. This group had a mean score of 64.39 on the re-test. This represented a mean difference increase in motor ability of 16.53 points between the test and re-test. The "t" value of 10.08, with 27 degrees of freedom, indicated significance at the .05 level of confidence; therefore, the null hypothesis was rejected.

The Captain Select Class was compared with the Motor Ability Class, in the pre-test of the Johnson Motor Educability, and the mean difference in motor ability was 1.22 points. The "t" value of .348

with 52 degrees of freedom, indicated no significance at the .05 level of confidence. In the comparison of the Captain Select Class with the Motor Ability Class in the re-test of the Johnson Motor Educability, the mean difference in motor ability was 3.35 points. The "t" value of .54 with 52 degrees of freedom, indicated no significance at the .05 level of confidence; therefore, the null hypothesis was accepted.

Attitude Inventory

The Captain Select Class had an original mean score on the attitude scale of 133.35. The score of the mean on the re-test of this group was 133.38. This represented a difference of .03 points between the test and re-test. The "t" value of .01, with 25 degrees of freedom, indicated no significance at the .05 level of confidence. The null hypothesis, therefore, was accepted.

The Motor Ability Class had an original mean score on the attitude scale of 132.54. The score of the mean on the re-test of this group was 134.68. This represented a difference of 2.14 points between the test and re-test. The "t" value of .77, with 27 degrees of freedom, indicated no significance at the .05 level of confidence. The null hypothesis, therefore, was accepted.

In the comparison of the Captain Select Class with the Motor Ability Class in the pre-test of the Modified Kneer Attitude Inventory, the mean difference in attitude was .81 points. The "t" value of .12 with 52 degrees of freedom, indicated no significance at the .05 level of confidence. In the comparison of the Captain Select Class with the Motor Ability Class in the re-test of the Modified Kneer Attitude Inventory, the mean difference in attitude was 1.30 points. The

"t" value of .23 with 52 degrees of freedom, indicated no significance at the .05 level of confidence; therefore, the null hypothesis was accepted.

Gymnastic Skills

The Captain Select Class had a mean score of 29.12 on the gymnastic skills. The Motor Ability Class had a mean score of 25.14 on the gymnastic skills. In the comparison of the Captain Select Class with the Motor Ability Class of the gymnastic skills, the mean difference in gymnastic skills was 3.98 points. The "t" value of 1.02 with 52 degrees of freedom, indicated no significance at the .05 level of confidence; therefore, the null hypothesis was accepted.

CHAPTER IV

DISCUSSION

The writer taught physical education at Mackenzie Junior High School and was physical education supervisor of the elementary schools in Dauphin, Manitoba at the time of this investigation. He had been physical education supervisor from Grades 1 to 12 in the Dauphin-Ochre School Division for two years prior to this study.

Some students have demonstrated a negative attitude toward gymnastics. As a result they stood around and found excuses not to actively participate. In many of the classes observed there was lack of organization or purpose in the program. Very little consideration was given to individual abilities and/or interests.

There were those students who appeared to enjoy whatever was dictated to them. Others demonstrated little one way or another. There were many who sat out and did not attempt any of the skills taught. Some of the reasons for not taking part varied from, "I get a headache," to "I get sick," to "my mother doesn't want me to," or "I can't do a thing."

Gymnastics can be one of the most challenging and interesting activities in the physical education program. It was the writer's belief that grouping students according to ability or interest would motivate interest and enhance a more practical learning climate for them.

This problem led the writer to investigate previous studies that had been done on the grouping of students. There were those who believed that, for a desirable learning environment to prevail, the best technique to employ for grouping students was according to ability while there were others who felt that social factors were more important. The writer has grouped students using both methods and positive results appeared to have occurred. On the basis of information drawn from previous studies and experience, it was decided that grouping by ability and interest would be attempted.

At the completion of the unit it was felt that some students worked well in a social system while others worked well in an ability system. It was the writer's feeling that those students who work well individually or who have a positive attitude would be just as well off in either system. The students with a negative attitude more than likely would work more efficiently in an ability system with a good leader. Emotional or easy going students would likely perform better in a social system. It is important that students are not arbitrarily placed in groups when grouping for gymnastic classes or any other class. Each individual's character, attitude, and interest should be considered and the system which best meets these demands be selected.

Initially there was no difference in motor ability and attitude between both classes. This phenomenon could be attributed to the fact that for the previous two years both classes had been taught gymnastics by the same instructor using the same approach.

The writer observed, during the five week interim between tests, that the two classes demonstrated active interest in participation. It appeared that both classes put forth the same effort in trying to

improve their skills. The students were given some freedom of choice at each station. At first this appeared to be a novelty to many of the students. Once the novelty somewhat wore off and the purpose of the program was better understood, all students took active part. However, there were a few who had to be somewhat pressured by team members to participate. Once they got their "feet wet" they seemed to put forth more of an individual effort in the next class periods.

Teams with good leaders scored high on the gymnastic skills. There appeared to be a direct relationship between team leader ability and team skill achievement. The students who worked well independently also scored better than the class average. The students scoring the lowest in skill achievement appeared to be those who vied for the position of team leader.

There appeared to be some dissatisfaction among some members of the Motor Ability Class teams. Three students very noticeably jutted out from their team. These three students markedly regressed in attitude and scored very low in gymnastic skills. One team lacked leadership and scored considerably lower than the class gymnastic skills mean. The students who could work well independently scored high in gymnastic skill but had little change in attitude. Initially their attitude was good and they likely could easily adapt to any situation.

The school system in which this program was taught, was teacher directed in most cases. The leader that assumed the teacher's role had good results. But, the leaders, who seemed to be lost without someone directing them all the time, had many wasted moments.

The team meetings that were held prior to every instructional class were usually very rushed with little time spent in the specificity of skills and the role of a team leader. As a result it affected the regular instructional classes. There was a wide range in standards utilized by each team leader for many of the skills that were to be checked off when successfully completed. The leaders, who were very conscientious and knew the skills well, graded the students accordingly. Team leaders, who had somewhat of a carefree attitude, had low standards for skill achievement. More time should have been spent in training the leader to make good evaluations.

Performance on the Johnson Test appeared to be very dependent on the mental attitude the students derived from observation of fellow students performing the stunts. If the first student scored well then invariably the other students also scored high.

On the re-test of the Johnson Test the students appeared to have a better mental picture and understanding regarding performance. There were few problems on any of the test items and all students except one scored considerably higher.

It was the writer's belief that the Johnson Motor Educability Test appeared to be a more valid instrument than the Iowa-Brace test for ability grouping in gymnastics. It was quite obvious that the students who scored high on the Johnson Test also had the potential of being good gymnasts.

It was of interest to the writer to note that there was no significant improvement in attitude. This rejected the basic assumption that students' attitude would improve considerably when exposed to an organized progressive program.

From the investigator's viewpoint, it was felt that the following factors may have contributed to this result:

1. Attitudes on the part of both classes exhibited a fairly high score at the beginning of the experiment.
2. Attitudes may be quite difficult to change once students have reached ninth grade.
3. The relation of pupil-teacher with respect to the personality variable seemed to strongly influence negative and positive scores on the final test. The investigator felt that those students who tended to like their instructor scored more positively than those students who apparently exhibited negative feelings toward this individual.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to determine if there was marked improvement in attitude and motor ability in gymnastic classes grouped either by motor-educability or by a democratic method and if there was any significant difference between the two groups as far as attitude towards gymnastics, motor ability and gymnastic skills. The measuring instruments used were the Johnson Motor-Educability test, the Modified Kneer Attitude Inventory and a gymnastic skill check list.

The participants of this study were grade nine boys at Mackenzie Junior High School in Dauphin, Manitoba, who were enrolled in the regular required physical education program. Two classes were selected and equalized according to the results of the Johnson Motor-Educability test. One of the classes was arbitrarily chosen to be the Motor Ability Class. Five teams were formed in the class and members of the teams were selected according to the results of selected items of the Iowa Brace Test. The other class was known as the Captain Select Class. Five teams were formed in the class and members of the teams were selected by captains who had been elected by the students in the class. There were 28 boys in the Motor Ability Class and 26 boys in the Captain Select Class. Both classes were tested on the Johnson Motor-Educability test and the Modified Kneer Attitude Inventory prior to gymnastic instruction.

Both classes met three days in a six-day cycle for 40 minutes per day. Approximately 25 minutes were devoted to activity. The program followed by both classes was the same. Gymnastic skill achievements were recorded during the course of the unit. Both classes were re-tested at the end of the gymnastic unit and scores were compared.

Comparisons were made between test and re-test within each class for motor ability and attitude. Comparisons were also made between classes for motor ability, attitude and skill achievement. The mean difference of the scores were compared.

The null hypothesis was assumed with respect to the differences within the classes and between the classes. This hypothesis was tested with the "t" technique for the differences between means derived from correlated and uncorrelated scores from small samples. Comparisons within the classes used the "t" technique for the difference between means derived from correlated scores from small samples. Comparisons between classes used the "t" technique for uncorrelated data from small samples.

Findings

The analysis and interpretation of the data revealed the following information:

1. Subjects in the Captain Select Class showed a significant improvement in general motor ability.
2. Subjects in the Motor Ability Class showed a significant improvement in general motor ability.
3. There was no significant difference in general motor ability between the Captain Select Class and the Motor Ability Class.

4. Subjects in the Captain Select Class did not show a significant improvement in attitude toward gymnastics.
5. Subjects in the Motor Ability Class did not show a significant improvement in attitude toward gymnastics.
6. There was no significant difference in attitude toward gymnastics between the Captain Select Class and the Motor Ability Class.
7. There was no significant difference in gymnastic skills between the Captain Select Class and the Motor Ability Class.

Conclusions

On the basis of the analyzed data, the following conclusions were drawn:

1. A class grouped by a democratic technique will be as effective in motor ability, attitude towards gymnastics and gymnastic skills as a class grouped by motor ability.
2. The selection of the method used for grouping in a gymnastic class should be determined by the instructor's personal preference and to the type of system that will be the most effective with a selected group of students.

Recommendations

Inasmuch as the results of the study showed that there was no significant difference between the two classes and that there was no significant improvement in attitude toward gymnastics for either class, the writer recommends the following:

1. Further studies should be undertaken to determine validity of results with students of both classes toward improvement in motor ability.
2. The writer recommends that physical education instructors seriously consider the grouping of students in gymnastic classes according to ability and/or interest. This may contribute to more effective instruction and more meaningful experience in gymnastic classes.
3. A study of ability grouping with relation to attitude toward an activity should be undertaken to determine if there is a significant relationship between level of ability and satisfying needs in activities.
4. A study of social grouping with relation to abilities in an activity should be undertaken to determine if there is a significant relationship between them.
5. A similar investigation should be made at the junior/senior high school level with an emphasis on design of instruction to meet the various needs and interests of each class with respect to motor ability, skills and attitudes.

APPENDIX A

SELECTED ITEMS OF THE REVISED IOWA-BRACE MOTOR-EDUCABILITY TEST

Scoring:

Two trials for each stunt were allowed with no practice in advance. Scoring was done on a pass or fail basis. Two points were awarded if the first trial was successful. One point was awarded if the second trial was successful, and no points were awarded if both trials failed. The highest possible score that could be obtained was 16.

Equipment:

No special equipment was used other than mats to prevent bruising on the falls resulting from loss of balance.

A brief description of the stunts used on the selection test as taken from McCloy and Young (1954) is as follows:

1. Iowa Test number (8). Double-Heel-Click Test. Jump upward, clap feet together twice and land with feet apart (any distance. Failure: (a) not to clap feet together twice; (b) to land with feet touching each other.

2. Iowa Test number (10). Jump-Foot Test. Hold toes of one foot in opposite hand. Jump upward, with free foot jumping over the foot that is held. Do not release the hold of the foot. Failure: (a) to release the foot that is held; (b) not to jump through the loop made by foot and arm.

3. Iowa Test number (17). Cross-Leg-Squat Test. Fold arms across chest. Cross feet and sit down. Get up without unfolding arms and without moving feet about to regain the balance. Failure: (a) to unfold arms; (b) to lose the balance; (c) not to get up.

4. Iowa Test number (22). One-Knee-Balance Test. Right face, kneel on one knee, with other leg raised from the floor and with arms raised sideward to the level of the shoulders. Hold the position for five counts. Failure: (a) to touch the floor with any part of the body other than one lower leg; (b) to fall over.

5. Iowa Test number (23). One-Knee-Head-to-the-Floor Test. Kneel on one knee, with the other leg raised behind the body and not touching the floor, and with arms raised sidewards to the level of the shoulders. Bend trunk forward, touching head to the floor, and raise head from the floor without losing the balance. Failure: (a) to lose the balance; (b) not to touch the floor with the head; (c) to touch the floor with any part of the body other than head and leg supporting the weight of the body.

6. Iowa Test number (29). Russian-Dance Test. Squat. Raise one leg forward. Perform a Russian dance step by extending legs alternately while in a squat position. Perform four such steps, that is, two with each leg. Heel of forward foot may touch the floor. Heel of rear foot should strike hip on that side. Failure: (a) to lose the balance; (b) not to do the stunt twice with each leg.

7. Iowa Test number (30). Top Test. Sit with lower legs flexed, on the floor. Put arms between legs, and under and behind knees, and grasp ankles. Roll rapidly around to the right, with the weight first over the right knee, then over the right shoulder, then on back, then on left shoulder, then on left knee. Sit up facing the opposite direction from which the test was started. Repeat the movements from this position and finish facing the same direction

from which the test was started. Failure: (a) to release hold of the ankles; (b) not to complete the circle.

8. Iowa Test number (31). Single-Squat Balance Test. Squat on either foot. With hands on the hips raise one leg forward. Hold this position for five counts. Failure: (a) to remove hands from hips; (b) to touch the floor with raised leg; (c) not to hold the balance for five seconds.

THE JOHNSON MOTOR-EDUCABILITY TEST

Scoring:

The maximum score was a possible 100 points, or 10 points for each exercise. All exercises had to be performed with a reasonable erect posture. All jumps had to be performed with a regular rhythm at about the rate of two short jumps to the second, or five seconds for each exercise.

Equipment:

Two tumbling mats were placed together. A rectangular pattern was marked off 4½ feet wide and 15 feet long. They were divided into squares 18 inches on a side. This made three lanes 18 inches wide down the length of the mat.

The second, fourth and alternate squares on the outside lanes were painted with black stripes. The center lane had no squares, but the first, third and alternate spaces had targets, 3 inches by 12 inches, in the center of the square.

One lane, 2 feet wide, is marked off down the center of the mat and was painted red. This land was for the rolling exercises.

Itemized Description

1. Straddle Jump: Hands are on hips. Start with feet together on the first center target. Jump astraddle to the first two black squares. Return to feet-together position on the second target. Proceed in the same manner across the mat in regular jumps, finishing on the finish target. Points are deducted from a possible perfect score of 10 as follows:

A. Deduct one from the score for each jump in which the feet do not land at the same time.

B. Deduct one for each jump in which the feet do not land at the same time.

C. Deduct one if the hands are removed from the hips some where in the exercise.

D. Deduct one, but not more than one, if the rhythm is not maintained or broken.

2. Stagger Skip: Hands are on hips. Start with the feet together in front of the right lane. Step with the left foot on the first center target and hop, still on the left foot, to the first black square on the left. Step with the right foot to the second center target and hop, still on the right foot, to the second black square on the right. Continue in regular skips across the mat. Points are deducted from a possible perfect score of 10 in the same manner as Exercise 1, except that the feet do not come down together.

3. Stagger Jump: Hands are on hips. Feet are together throughout the exercise. Start with the feet to the first white square on the left, then obliquely with both feet to the first black square on the right, then to the second white square on the left, finishing on the finish target. Points are deducted from a possible perfect score of 10 in the same manner in Exercise 1.

4. Forward Skip, Holding Opposite Foot From Behind: Start with feet together before either the right or left lane. Hop with the right foot into the first white space, raising the left foot behind and taking it with the right hand behind the right thigh at the same time. Hop in this position on the right foot to the first black

space. Release the left foot and leap with the left foot to the second white space, lifting the right foot behind and taking it with the left hand behind the left thigh. Hop in this position on the left foot to the second black space. Continue across the mat in this manner. Points are deducted from a possible perfect score of 10 as follows:

A. Deduct one for each step or jump in which the subject oversteps a square or in which he does not have the proper position of hand and opposite foot or both. (Only one penalty is given for each square.)

B. Deduct one point for lack of rhythm.

5. Front Roll: Disregard all black markings and perform in the red lane. Start outside of chart in front of the center lane. Perform two front forward rolls, the first within the limits of the first half of the lane and the second within the limits of the second half, never touching or overreaching red lines. Points are deducted from a possible perfect score of 10 as follows:

A. Deduct two for overreaching the red line at the right or left in each roll. If the subject overreaches both sides, deduct four.

B. Deduct one for overreaching the limit on each roll.

C. For failure to perform a true roll, deduct five.

Each roll counts five points. If the subject fails on the first roll, she should be permitted to take her position and try the second roll.

6. Jumping Half Turns, Right or Left: Start with feet together on the first target, hands free. Jump, feet together, to the second target while executing a half turn right or left, ending on the second target and facing the starting end. Jump to the third target,

executing another half turn, rotating in the same direction (as a barrel would be rolled along upright), ending on the third target and facing the finish. Continue across the mat, ending on the finish target and facing the starting end. Points are deducted from a possible perfect score of 10 as follows:

A. Deduct two for each jump in which the subject does not land with both feet on the target, or turns the wrong way, or both.

Since the half-turn jumps are in the same direction, the scorer should not be too critical of the subject if she does not turn exactly 180 degrees.

7. Back Roll: Perform in the red lane. Start in front of the red lane with back to pattern. Execute two backward rolls, one on each half of the lane. Points are deducted from a possible perfect score of 10 in the same manner as in Exercise 5.

8. Jumping Half Turns, Right and Left Alternately: Start with feet together on the first target, hands free. Jump, feet together to the second target, executing a half turn either right or left, ending on the second target facing the starting end. Jump to the third target, executing a half turn in the opposite direction, ending on the third target facing the finish. Continue across the mat, alternating the direction of rotation, ending on the finish target and facing the starting end. Points are deducted from a possible perfect score of 10 in the same manner as in Exercise 6, except that since the individual turns alternately to right and left, the turn must be made approximately 180 degrees. If the individual lands on the target and makes no other error except that the turn is not quite 180 degrees, deduct one point.

9. Front and Back Roll Combination: Perform in the red lane. Start outside of mat in front of the center lane. Perform a front roll in the first half of the lane, finishing with legs crossed at ankles and executing a two-foot pivot, turning either right or left. Perform a backward roll in the second half of the lane. Points are deducted from a possible perfect score of 10 in the same manner as in Exercise 5, with the exception of the following:

A. Deduct one if the subject oversteps the end border or executes the turn incorrectly.

10. Jumping Full Turns: Start outside the mat in front of the first white space in either outside lane. Jump with feet together into the first black space in the same lane, executing a full turn with the body right or left. Continue across the mat, executing full turns, rotating in the same direction, being sure to land on both feet in the black spaces. Points are deducted from a possible perfect score of 10 in the same manner as in Exercise 6, with the following exceptions:

A. Deduct two if the subject fails to land on both feet simultaneously.

B. Deduct two if the subject oversteps the black square.

C. Deduct two if she turns too far or not far enough, or loses her balance before starting the next jump.

D. Deduct one if the only error is not making a complete 360-degree turn, but if she makes a turn of more than three-fourths of a circle.

KNEER ADAPTATION OF THE PHYSICAL EDUCATION
ATTITUDE INVENTORY

DIRECTIONS: Please read carefully: Below you will find some statements about physical education. We would like to know how you feel about each statement. You are asked to consider physical education only from the standpoint of its place as an activity course taught during a regular class period. No reference is intended in any statement to interscholastic or intramural athletics. People differ widely in the way they feel about each statement. There are only right or wrong answers.

You have been provided with a special answer sheet for recording your reaction to each statement. (a) Read each statement carefully, (b) go to the answer sheet and (c) opposite the number of the statement, place an "X" in the square which is under the word (or words) which best expresses your feeling about the statement. After reading a statement, you will know at once, in most cases, whether you agree or disagree with the statement. If you agree, then decide whether to place an "X" under "agree" or "strongly agree." If you disagree, then decide whether to place the "X" under "disagree" or "strongly disagree." In case you are undecided (or neutral) concerning your feeling about the statement, then place an "X" under "undecided." Try to avoid placing an "X" under "undecided" in very many instances. Whenever possible, let your own personal experiences determine your answer.

Work rapidly. Do not spend much time on any statement. This is not a test, but is simply a survey to determine how people feel about physical education. Your answers will in no way affect your

grade in any course. In fact, we are not interested in connecting any person with any paper--so please answer each statement as you actually feel about it. BE SURE TO ANSWER EVERY STATEMENT.

PART A

1. If for any reasons a few subjects have to be dropped from the school program, physical education should be one of the subjects dropped.
2. Students can better understand each other after meeting and playing together in physical education activities.
3. Physical education activities provide no chance for learning to control strong feelings, such as anger.
4. Taking part in lively physical activities gets one interested in using good health habits.
5. Physical education is one of the more important subjects in helping to teach practical acceptable rules of behavior with other people.
6. Time spent in dressing, showering, and playing in physical education class could be more valuable if spent in other ways.
7. Very active play works off strong feelings such as anger.
8. A person's body usually has all the strength it needs without taking part in physical education activities.
9. I would take physical education only if it were required.
10. Taking part in physical education activities tends to make one more likeable and better able to get along with other people.
11. Taking part in physical education gives no help in developing the ability to feel calm in strange situations.

12. Physical education in most schools does not receive the stress that it should.
13. Because physical skills seem very important in youth, it is necessary that a person be helped to learn and to improve such skills.
14. Physical education classes are poor in chances to learn how to get along with other people.
15. Exercises taken regularly are good for one's general health.
16. A person would be better able to control his feelings if he did not take part in physical education.
17. An average amount of skill in active games or sports is not necessary for leading the fullest kind of life.
18. It is possible to make physical education a valuable subject if a wide variety of useful activities is offered.
19. Physical education does more harm than it does good.
20. Developing a physical skill will relax your mind.
21. Meeting and playing with others in some physical education activity is fun.
22. Physical education classes provide nothing which will be of value outside of class.
23. Physical education classes provide no chances for learning to respect the right of others which will help one to become a better citizen.
24. There should not be over two one-hour periods per week given to physical education in schools.
25. Physical education situations are among the poorest for making friends.

26. Belonging to a group, for which opportunity is provided in team activities is a desirable experience for a person.
27. Physical education is not valuable enough to make it worth the time spent.
28. Physical education is an important subject in helping a person gain and keep all around good health.
29. Physical education skills will add to the joy and pleasure of living.
30. No definite good results come from taking part in physical education activities.
31. People get all the physical exercise they need in just taking care of their daily work.
32. Taking part in team sports during physical education is helpful in learning how to get along with people and how to make friends.
33. All who are physically able will profit from an hour of physical education each day.
34. Physical education activities tend to upset a person's feelings, for example, make him angry.
35. Physical education is helpful in building up enough extra strength and in improving the ability to keep going for daily living.
36. Physical education should be included in the program of every school because to helps a person to think better and to control strong feelings, such as anger.
37. Physical education makes one less friendly by encouraging people to do better than others in many of the activities.
38. I would advise anyone who is able to take physical education.

39. Taking part in sports, games and dance makes for a better understanding of life, and increases the enjoyment of it.

40. Physical education class is a waste of time in improving health.

THE MODIFIED KNEER ATTITUDE INVENTORY

DIRECTIONS: Please ready carefully: Below you will find some statements about gymnastics. We would like to know how you feel about each statement. You are asked to consider gymnastics only from the standpoint of its place as an activity taught during a regular class period. No reference is intended in any statement to the school's gymnastic club. People differ widely in the way they feel about each statement. There are only right or wrong answers.

You have been provided with a special answer sheet for recording your reaction to each statement. (a) Read each statement carefully, (b) go to the answer sheet and (c) opposite the number of the statement, place an "X" in the square which is under the word (or words) which best expresses your feeling about the statement. After reading a statement, you will know at once, in most cases, whether you agree or disagree with the statement. If you agree, then decide whether to place an "X" under "agree" or "strongly agree." If you disagree, then decide whether to place the "X" under "disagree" or "strongly disagree." In case you are undecided (or neutral) concerning your feeling about the statement, then place an "X" under "undecided." Try to avoid placing an "X" under "undecided" in very many instances. Whenever possible, let your own personal experiences determine your answer.

Work rapidly. Do not spend much time on any statement. This is not a test, but is simply a survey to determine how people feel about gymnastics. Your answers will in no way affect your grade in

any course. In fact, we are not interested in connecting any person with any paper--so please answer each statement as you actually feel about it. BE SURE TO ANSWER EVERY STATEMENT.

PART A

1. If for any reasons activities have to be dropped from the school physical education program, gymnastics should be one of the activities dropped.
2. Students can better understand each other after meeting and working together in gymnastic activities.
3. Gymnastic activities provide no chance for learning to control strong feelings, such as anger.
4. Taking part in gymnastics gets one interested in using good health habits.
5. Gymnastics is one of the more important activities in helping to teach practical acceptable rules of behavior with other people.
6. Time spent in dressing, showering, and working in gymnastic class could be more valuable if spent in other ways.
7. Very active gymnastic activities works off strong feelings such as anger.
8. A person's body usually has all the strength it needs without taking part in gymnastic activities.
9. I would take gymnastics only if it were required.
10. Taking part in gymnastic activities tends to make one more likeable and better able to get along with other people.
11. Taking part in gymnastics gives no help in developing the ability to feel calm in strange situations.

12. Gymnastics in most schools does not receive the stress that it should.
13. Gymnastic classes are poor in chances to learn how to get along with other people.
14. A person would be better able to control his feelings if he did not take part in gymnastics.
15. An average amount of skill in gymnastics is not necessary for leading the fullest kind of life.
16. It is possible to make gymnastics a valuable activity if a wide variety of skills are taught.
17. Gymnastics does more harm than it does good.
18. Developing a gymnastic skill will relax your mind.
19. Meeting and working with others in gymnastic activities is fun.
20. Gymnastic classes provide nothing which will be of value outside of class.
21. Gymnastic classes provide no chances for learning to respect the right of others which will help one to become a better citizen.
22. Situations in gymnastic classes are among the poorest for making friends.
23. Belonging to a group, for which opportunity is provided in team activities is a desirable experience for a person.
24. Gymnastics is not valuable enough to make it worth the time spent.
25. Gymnastics is an important activity in helping a person to gain and keep all around good health.
26. Gymnastic skills will add to the joy and pleasure of living.
27. No definite good results come from taking part in gymnastic activities.

28. Junior high students get all the physical exercise they need in just taking care of their daily work and participating in other sport activities without taking part in gymnastics.
29. Taking part in gymnastics during physical education is helpful in learning how to get along with people and how to make friends.
30. Gymnastic activities tend to upset a person's feelings, for example, make him angry.
31. Gymnastics is helpful in building up enough extra strength and in improving the ability to keep going for daily living.
32. Gymnastics should be included in the program of every school because it helps a person to think better and to control strong feelings, such as anger.
33. Gymnastics makes one less friendly by encouraging people to do better than others in many of the activities.
34. I would advise anyone who is able to take part in gymnastics.
35. Taking part in gymnastics makes for a better understanding of life, and increases the enjoyment of it.
36. Gymnastics class is a waste of time in improving health.

ILLUSTRATION 1
MAP FOR JOHNSON MOTOR-EDUCABILITY TEST

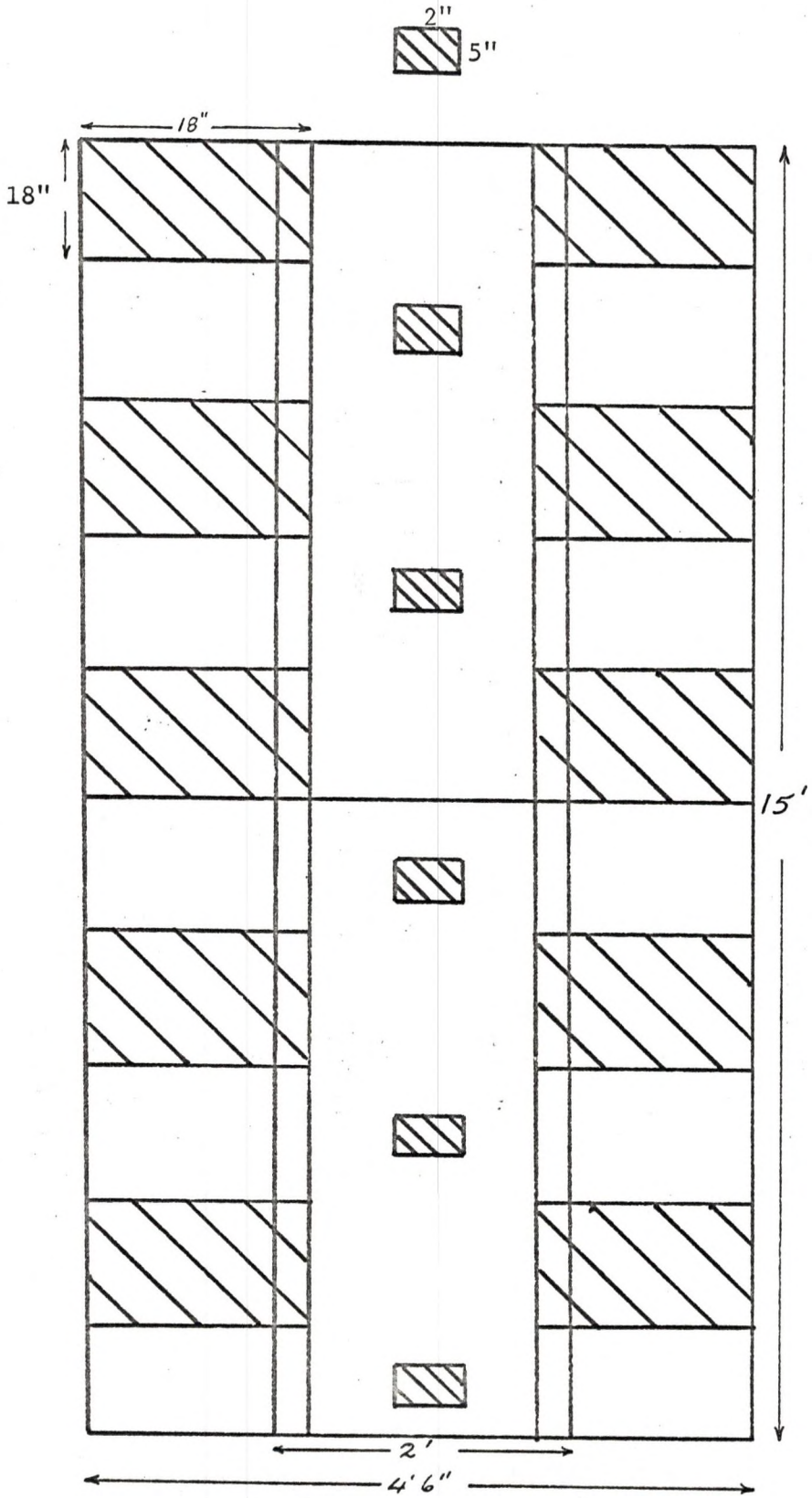
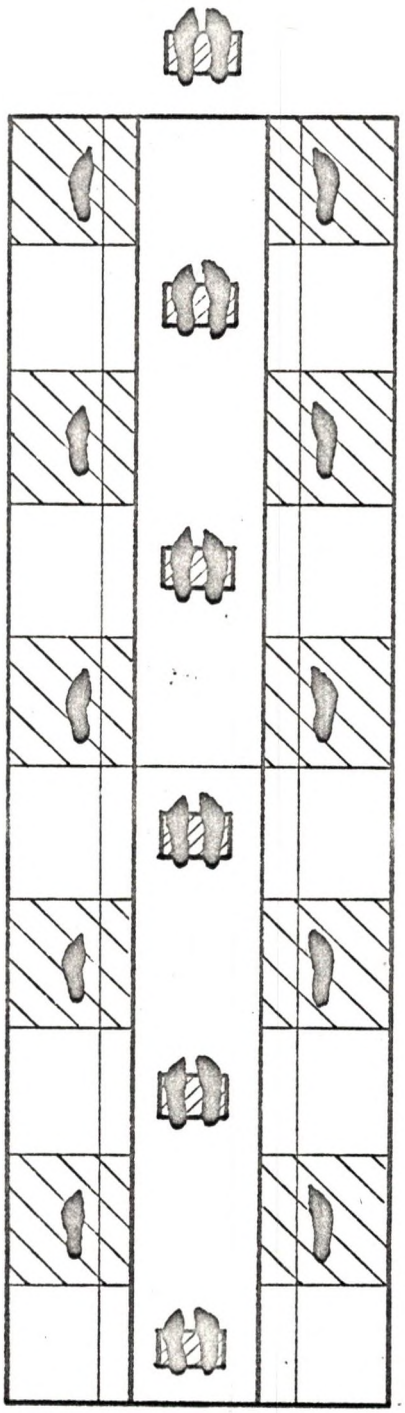


ILLUSTRATION 2

EXERCISE I

Straddle Jump

Finish



EXERCISE II

Stagger Skips

Finish

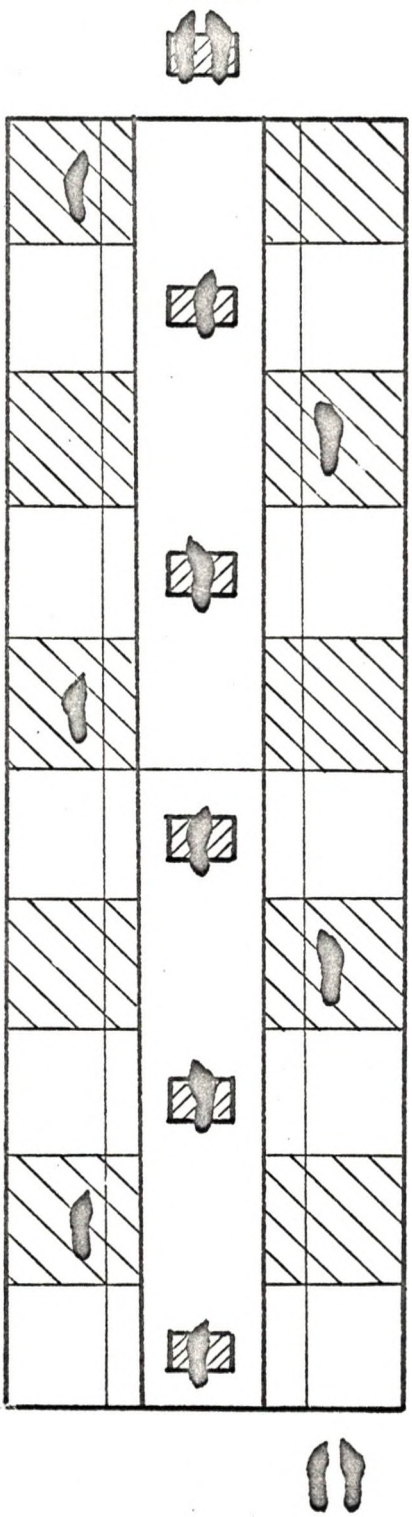
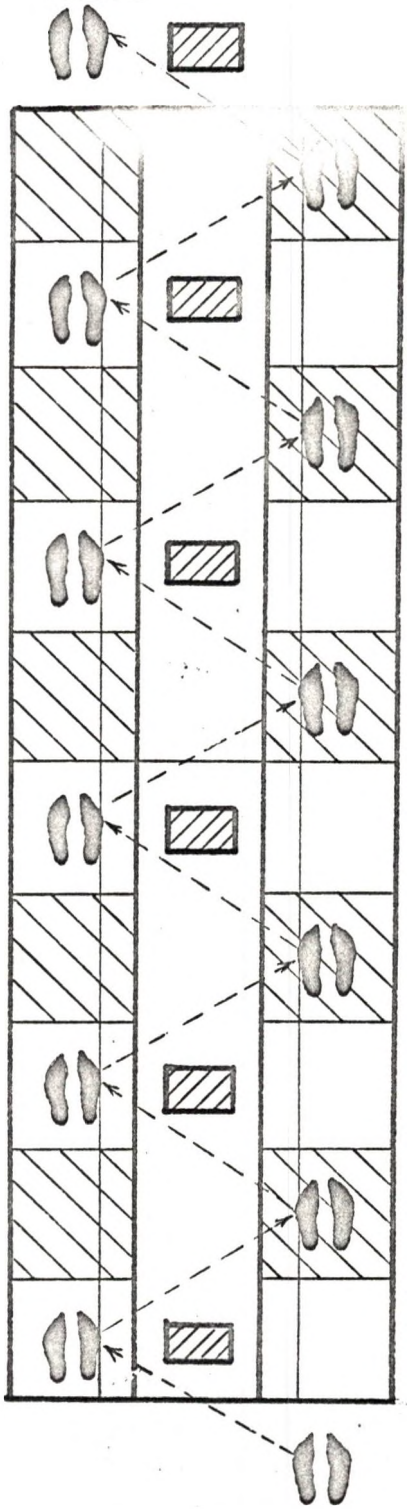


ILLUSTRATION 3

EXERCISE III

Stagger Jump

Finish



EXERCISE IV

Forward Skip, Holding Opposite Foot From Behind

Finish

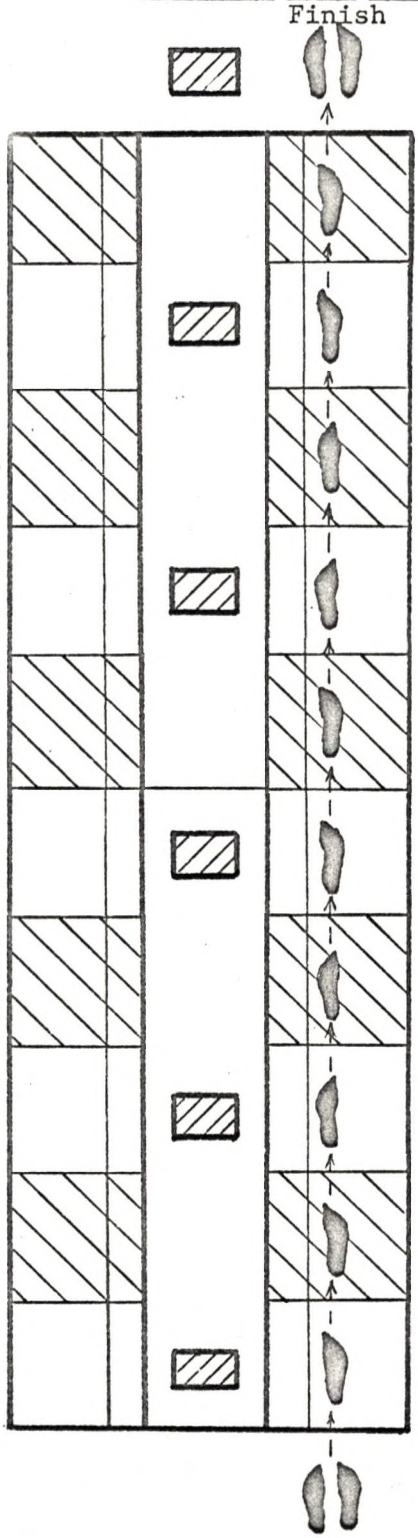
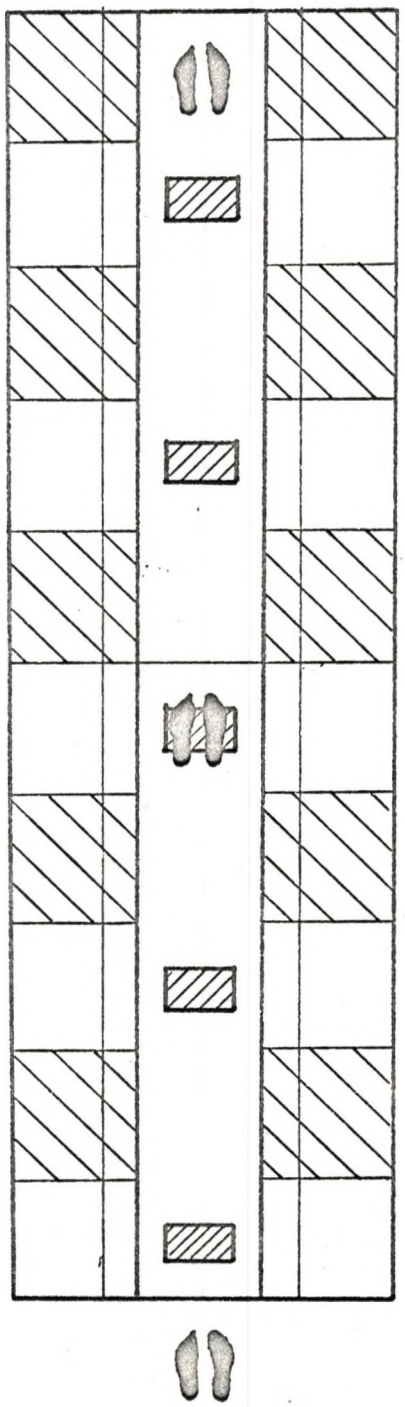


ILLUSTRATION 4

EXERCISE V

Forward Rolls

Finish



EXERCISE VI

Half Turns Right or Left

Finish

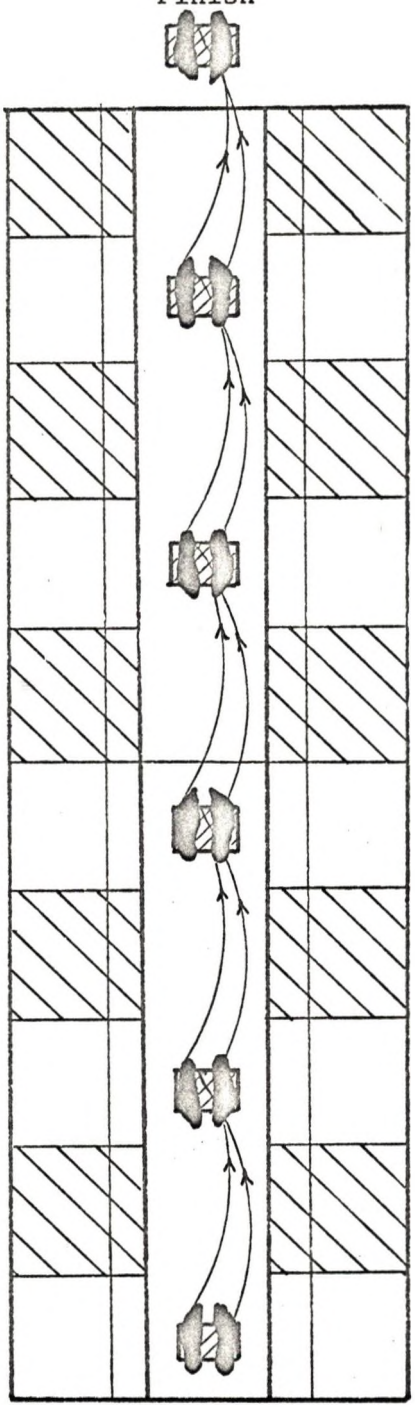
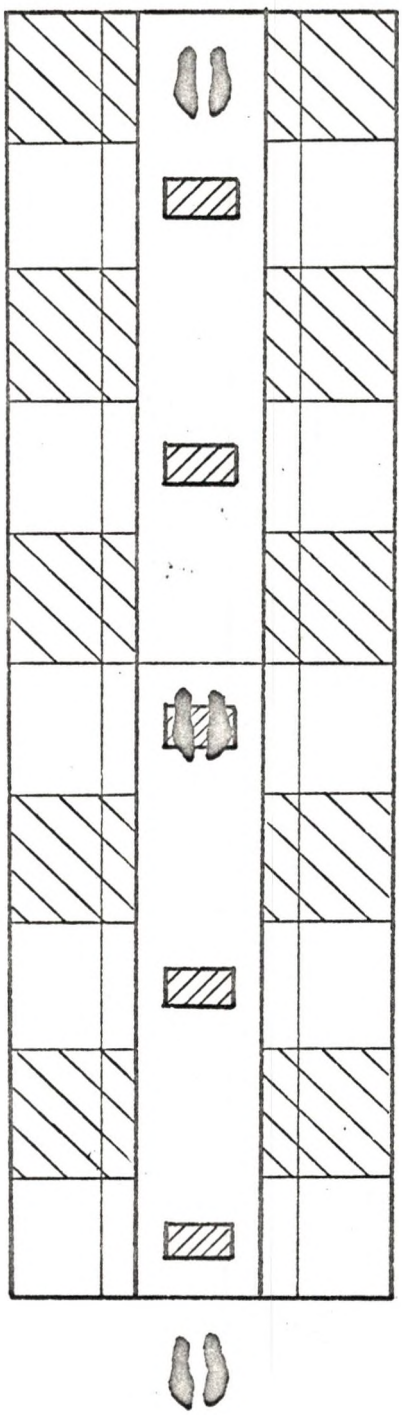


ILLUSTRATION 5

EXERCISE VII

Backward Rolls

Finish



EXERCISE VIII

Half Turns, Right and Left Alternate

Finish

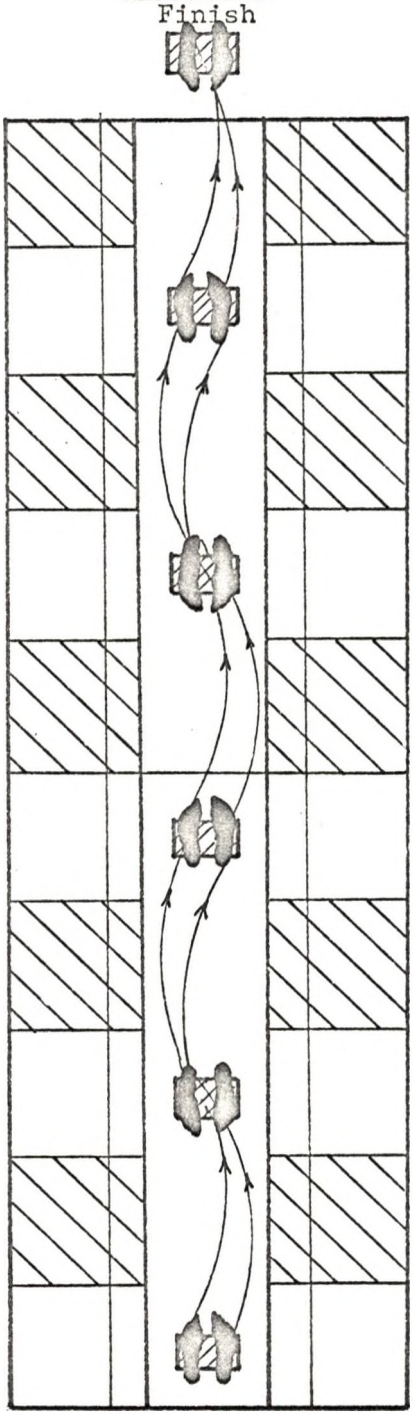
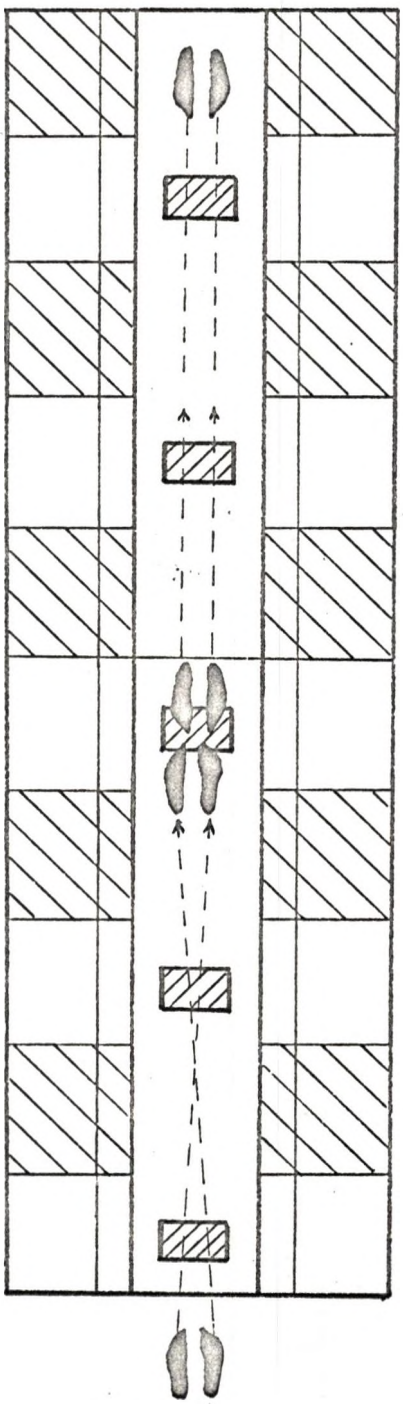


ILLUSTRATION 6

EXERCISE IX

Front and Back Roll Combination

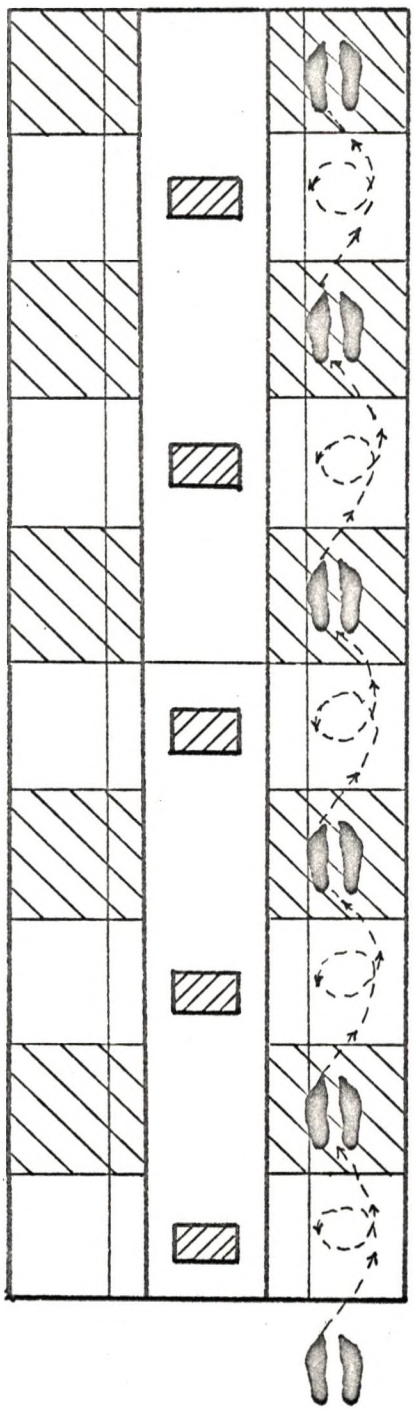
Finish



EXERCISE X

Full Turns Jumping

Finish



APPENDIX B

GYMNASTIC SKILLS

TUMBLING

Beginner Skills

1. Log Roll
2. Egg Roll
3. Shoulder Roll
4. Forward Roll
5. Backward Roll
6. Cartwheel
7. _____
8. _____
9. _____
10. Routine of 2 of above

Novice Skills

1. Foward Roll with Slight Dive
2. Back Roll in Piked Position
3. 2 Cartwheels
4. Forward Roll and Cross Over to Backward Roll
5. Round-off
6. Round-off and Back Roll
7. Chest Roll
8. Routine of 2 of above
9. _____
10. _____
11. Routine of above 2 groups (4)

Intermediate Skills

1. Two Dive Foward Roll
2. Handspring off Rolled Mat
3. Dive to Three-point Balance and Forward Roll
4. Back Extension
5. _____
6. _____
7. _____

Junior Skills

1. Headspring
3. Front Handspring
3. Flyspring
4. Back Handspring
5. Routine of 2 of above
6. _____
7. _____
8. Routine of above groups (4)

Advanced Skills

1. Three Headsprings
2. Standing Back Somersault
3. Three Back Handsprings
4. Tinsica
5. Round-off, Back Handspring
6. Round-off and Three Back Handsprings
7. Round-off Back Handspring, Back Somersault
8. Running Front Somersault
9. Routine of 2 of above
10. Routine of 1 of each group above
11. Routine of 8 stunts
12. _____
13. _____

VAULTING - CROSS BOX

Beginner Skills

1. Run on and Leap off - One Foot Take-off
2. Run on and Leap off - Two Feet Take-off
3. Flank Vault
4. Squat Mount and Leap off with Arch
5. Straddle Mount and Leap off with Arch
6. _____
7. _____
8. _____
9. _____

Intermediate Skills

1. Squat Vault
2. Straddle Vault
3. Low Front Vault
4. Squat Vault Quarter Turn
5. _____
6. _____
7. _____
8. _____
9. _____

Junior Skills

1. Thief Vault
2. Neck Spring
3. Head Spring
4. Hand Spring
5. High Front Vault
6. _____
7. _____
8. _____

Advanced Skills

1. Stoop Vault
2. Short Armspring
3. Handstand Quarter Turn
4. Handstand Squat Through
5. Handstand Straddle Dismount
6. Handstand Straight Leg Cut Through
7. Swan
8. _____
9. _____
10. _____

VAULTING - LONG BOX

Beginner Skills

1. Run on and Leap off - One Foot Take-off
2. Run on and Leap off - Two Feet Take-off
3. Jump to Group, Straddle Vault over Neck
4. Jump to Group, Squat Vault over Neck
5. _____
6. _____
7. _____

Intermediate Skills

1. Jump to Group, Front Roll Dismount
2. Straddle Seat, Front Roll Dismount
3. Head Kip from Neck
4. Jump to Group, Neck Spring from Neck
5. Jump to Group, Head Spring from Neck
6. Jump to Group, Short Arm Spring
7. Jump to Group, Hand Spring from Neck
8. _____
9. _____
10. _____

Junior Skills

1. Jump to Group, Hand Balance Quarter Turn
2. Jump to Group, Hand Balance, Straddle Vault Dismount
3. Jump to Group, Hand Balance, Straight Arm Cut Through
4. Jump to Group, Hand Balance, Squat Vault Dismount
5. _____
6. _____
7. _____

Advanced Skills

1. Straddle Vault Over Neck
2. Squat Vault Over Neck
3. Stoop Vault Over Neck
4. Swan Vault Over Neck
5. Cartwheel
6. Headspring from Neck
7. Handspring from Neck
8. Giant Straddle
9. Giant Stoop
10. _____
11. _____
12. _____

FLOOR EXERCISE

Beginners Skills

1. Five Push Ups
2. Tip Up
3. Hollow Back Roll
4. Front Support
5. Back Support
6. Bent Leg Scale
7. Tuck, Pike & Layout Positions
8. _____
9. _____
10. Routine of 2 of above

Novice Skills

1. Three Point Balance
2. Single Leg Circles (3)
3. Jump to High Straddle
4. Lunge Position
5. From Front Support, Squat Through to Back Support
6. Scale on Either leg
7. Forward Roll
8. Supported Handstand
9. Supported Headstand
10. _____
11. _____
12. Routine of any 4 of above from any group

Intermediate Skills

1. Head Balance
2. Snap Down
3. Back Roll to Straddle Stand, Hands in Horizontal Position
4. High "V" with Straight Arm Support
5. Cartwheel, Quarter Turn and Forward Roll
6. Scale, Kick to Handstand and Forward Roll
7. Neck Kip
8. _____
9. _____
10. Routine of 6 of above from any group.

Junior Skills

1. Three Leaps Across Floor
2. Shoulder Support with Hands on Hips
3. Two or Three Running Steps and Hitch Kick
4. From Standing Position, Lower to Back Bend
5. From Standing Position, Jump to Arch Position
6. From Standing Position, Fall to Bent Arm Front Support, One Leg Gyper-extended
7. From Front Support, Snap to Pike, Arched Pike Stand
8. From Front Support, Cut Both Legs Under Either Arm to Back Support in Arch Position
9. Head Balance to a Forward Roll Straddle Stand
10. From a Sitting Position: lay back to back extension and snapdown with one leg and half turn to stand with free leg in a forward piked position
11. From Front Support, Straddle Both Legs Under Arms to a Rear Support
    Two Cartwheels to Quarter Turn and Immediate Handstand (no hold) and Forward Roll to Stand
13. _____
14. _____
15. Routine of 8 from any group

Advanced Skills

1. Front Handspring to Headspring
2. From a Stand, Step Forward with Either Leg to Immediate Jump with ½ turn to Scale
3. From Prone Position with Arms Extended Forward, Full forward and Press, with Straight Legs, to a Head Balance
4. Kick to Handstand and Hold for 3 seconds
5. From Standing Position, Sit with Straight Legs to a Back extension and immediately snapdown to a back handspring
6. Snap-down to a Back Handspring, ½ turn to Immediate Front Handspring
7. From Handstand, Execute Half Pirouette
8. From Handstand, Lower to Immediate Headspring
9. From a Scale, Kick up to Handstand and Hold
10. Press to Handstand, with Bent Arms and Bent Legs
11. From Handstand, Execute Forward Roll with Straight Arms to a stand with straight legs
12. Split
13. Round-off Back Handspring
14. _____
15. _____
16. Routine of 10 from any groups

Junior Skills

1. Three Leaps Across Floor
2. Shoulder Support with Hands on Hips
3. Two or Three Running Steps and Hitch Kick
4. From Standing Position, Lower to Back Bend
5. From Standing Position, Jump to Arch Position
6. From Standing Position, Fall to Bent Arm Front Support, One Leg Gyper-extended
7. From Front Support, Snap to Pike, Arched Pike Stand
8. From Front Support, Cut Both Legs Under Either Arm to Back Support in Arch Position
9. Head Balance to a Forward Roll Straddle Stand
10. From a Sitting Position: lay back to back extension and snapdown with one leg and half turn to stand with free leg in a forward piked position
11. From Front Support, Straddle Both Legs Under Arms to a Rear Support
    Two Cartwheels to Quarter Turn and Immediate Handstand (no hold) and Forward Roll to Stand
13. _____
14. _____
15. Routine of 8 from any group

Advanced Skills

1. Front Handspring to Headspring
2. From a Stand, Step Forward with Either Leg to Immediate Jump with ½ Turn to Scale
3. From Prone Position with Arms Extended Forward, Full Forward and Press, with Straight Legs, to a Head Balance
4. Kick to Handstand and Hold for 3 seconds
5. From Standing Position, Sit with Straight Legs to a Back Extension and immediately snapdown to a back handspring.
6. Snap-down to a Back Handspring, ½ turn to Immediate Front Handspring.
7. From Handstand, Execute Half Pirouette
8. From Handstand, Lower to Immediate Headspring
9. From a Scale, Kick up to Handstand and Hold
10. Press to Handstand, with Bent Arms and Bent Legs
11. From Handstand, Execute Forward Roll with Straight Arms to a stand with straight legs
12. Split
13. Round-off Back Handspring
14. _____
15. _____
16. Routine of 10 from any groups.

BALANCE BEAM

Beginners Skills

1. Walk Forward
2. Walk Backward
3. Straight Arm Support Mount
4. Plie Walk (Dip Step) Forward
5. Plie Walk (Dip Step) Backward
6. Side Seat Mount
7. Side Support
8. Side Step
9. Front Scale
10. Squat Turn on Beam
11. One Leg Squat Forward
12. _____
13. _____
14. Routine of 3 of above

Novice Skills

1. Squat - Sit - Lie Along Beam
2. Side Cross Step
3. Single Knee Mount
4. Knee Scale
5. Pirouette Turn
6. Pivot Turn
7. Side Seat, Swing Legs to Other Side
8. Squat Balance
9. Run
10. From Squat, Jump off Balance Beam with Arch
11. _____
12. _____
13. Routine of 6 of above groups

Intermediate Skills

1. Crotch Seat Mount
2. Wolf Vault Mount
3. Step Hop
4. Lunge & Turn
5. V Sit (Hands Behind)
6. Tip Toe Turn
7. Skip
8. Arabesque Turn
9. Straddle Jump off Dismount
10. _____
11. _____

SPRING BOARD

Beginners Skills

1. Spring for Height - using rope
2. Spring for Height - no rope
3. Half Twist
4. _____
5. _____
6. _____
7. _____

Intermediate Skills

1. Dive Through Hoop
2. Straddle Toe Touch
3. Tuck
4. _____
5. _____
6. _____

Junior Skills

1. Pike Toe Touch
2. Full Twist
3. Front Flip - tuck
4. _____
5. _____
6. _____

Advanced Skills

1. Front Flip - layout
2. Back Flip
3. _____
4. _____
5. _____

APPENDIX C

THE MODIFIED KNEER ATTITUDE INVENTORY

ANSWER SHEET

5 _____ _____

4 _____ _____

Name _____ 3 _____ _____

Class _____ Date _____ 2 _____ _____

Instructor _____ 1 _____ _____

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	( )	( )	( )	( )	( )	19.	( )	( )	( )	( )	( )
2.	( )	( )	( )	( )	( )	20.	( )	( )	( )	( )	( )
3.	( )	( )	( )	( )	( )	21.	( )	( )	( )	( )	( )
4.	( )	( )	( )	( )	( )	22.	( )	( )	( )	( )	( )
5.	( )	( )	( )	( )	( )	23.	( )	( )	( )	( )	( )
6.	( )	( )	( )	( )	( )	24.	( )	( )	( )	( )	( )
7.	( )	( )	( )	( )	( )	25.	( )	( )	( )	( )	( )
8.	( )	( )	( )	( )	( )	26.	( )	( )	( )	( )	( )
9.	( )	( )	( )	( )	( )	27.	( )	( )	( )	( )	( )
10.	( )	( )	( )	( )	( )	28.	( )	( )	( )	( )	( )
11.	( )	( )	( )	( )	( )	29.	( )	( )	( )	( )	( )
12.	( )	( )	( )	( )	( )	30.	( )	( )	( )	( )	( )
13.	( )	( )	( )	( )	( )	31.	( )	( )	( )	( )	( )
14.	( )	( )	( )	( )	( )	32.	( )	( )	( )	( )	( )
15.	( )	( )	( )	( )	( )	33.	( )	( )	( )	( )	( )
16.	( )	( )	( )	( )	( )	34.	( )	( )	( )	( )	( )
17.	( )	( )	( )	( )	( )	35.	( )	( )	( )	( )	( )
18.	( )	( )	( )	( )	( )	36.	( )	( )	( )	( )	( )

GYMNASTIC SKILLS RECORDING FORM

Name_____ Class_____

TUMBLING

Beginner											Novice											Intermediate							Junior				
1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	1	2	3	4	5

FLOOR EXERCISE

Advanced															Beginner												Novice							
6	7	8	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8

Intermediate																Junior														Advanced					
9	10	11	12	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7

VAULTING - CROSS BOX

Beginner															Intermediate													Junior						
8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2

VAULTING - LONG BOX

Advanced								Beginner								Intermediate										Junior							
3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	1	2

SPRING BOARD

Advanced										Beginner							Intermediate							Junior						Advanced				
3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5

TABLE 1

SELECTED ITEMS OF THE IOWA BRACE MOTOR-EDUCABILITY TEST SCORE SHEET

Class Motor Ability

SUBJECT	TEST ITEM 1	2	3	4	5	6	7	8	Total
1	1	0	0	2	1	1	1	1	7
2	1	0	2	2	0	2	0	0	7
3	0	0	1	1	1	0	2	1	6
4	1	1	2	0	2	1	0	0	7
5	1	0	1	2	2	1	0	2	9
6	0	0	0	2	0	1	0	0	3
7	0	0	2	2	2	1	0	0	7
8	1	0	0	1	1	2	1	2	8
9	1	0	1	2	1	1	1	1	8
10	1	0	2	2	2	1	0	1	9
11	2	0	2	2	0	2	0	0	8
12	2	0	2	2	1	2	1	0	10
13	0	0	0	2	0	0	0	0	2
14	2	0	2	2	2	1	0	1	10
15	1	1	2	1	2	2	2	1	12
16	2	1	2	2	0	2	0	0	9
17	0	0	0	2	2	2	1	1	8
18	0	0	0	0	1	2	2	1	6
19	2	2	2	2	2	0	0	2	12
20	2	1	2	2	1	2	1	1	12
21	2	0	2	2	1	0	2	0	9
22	1	0	2	2	0	2	2	1	10
23	2	0	2	2	2	2	0	1	11
24	2	2	2	2	2	2	2	0	14
25	0	0	1	2	2	2	1	1	9
26	1	0	1	2	2	1	0	1	8
27	0	0	2	2	2	1	2	2	11
28	2	1	1	2	2	2	2	2	14

TABLE 2

THE JOHNSON MOTOR-EDUCABILITY TEST SCORE SHEET

Class Captain Select

SUBJECT	Test Trial 1		2		3		4		5		6		7		8		9		10		TOTAL	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2		
1	9	8	9	9	2	9	0	4	10	10	8	9	0	7	4	8	6	6	0	0	48	70
2	9	10	10	8	4	8	7	9	7	7	6	6	6	8	6	10	4	9	0	0	59	75
3	9	8	9	9	0	9	1	10	5	10	8	7	2	4	8	10	5	6	0	0	47	73
4	8	10	8	9	8	10	0	7	10	10	8	7	10	8	8	10	7	9	0	0	67	80
5	7	7	5	8	1	6	8	10	10	10	8	7	6	5	10	10	3	5	0	0	58	68
6	10	8	10	8	2	6	1	5	0	3	8	8	0	5	8	8	2	6	0	0	41	57
7	7	9	10	9	0	2	0	1	0	0	0	8	0	0	2	8	0	0	0	0	19	37
8	9	6	0	9	1	1	8	8	0	2	6	10	0	0	6	8	0	4	0	0	30	48
9	9	8	10	8	9	10	9	9	6	5	6	3	0	0	8	7	5	2	0	0	62	52
10	8	9	5	9	3	9	1	6	8	10	6	6	5	9	6	8	4	7	0	0	46	73
11	7	8	1	1	1	9	1	4	0	10	4	10	0	8	8	4	0	5	0	0	22	59
12	6	7	6	10	8	8	9	8	8	8	2	8	2	0	6	10	2	4	0	0	49	63
13	7	5	5	5	7	8	0	0	2	4	2	7	0	0	8	6	3	2	0	0	34	37
14	6	8	6	9	0	7	9	10	6	8	6	6	2	0	6	10	5	4	0	0	46	62
15	8	10	1	8	8	10	2	7	0	2	10	10	6	4	8	8	5	2	0	0	48	61
16	8	8	0	10	10	10	6	8	9	10	8	6	6	8	10	8	8	9	0	2	65	79
17	10	10	8	10	8	5	9	6	10	9	6	10	0	0	8	8	1	4	0	0	60	62
18	8	8	10	9	3	5	9	8	0	5	0	6	0	0	6	9	0	2	0	2	36	54
19	2	8	5	6	1	5	1	2	9	8	8	10	0	2	10	10	1	7	0	0	37	58
20	7	9	9	8	1	5	0	7	10	8	8	6	0	0	2	6	3	3	0	0	40	52
21	7	9	4	10	0	7	2	7	7	6	2	4	0	0	1	7	1	2	0	0	24	52
22	10	10	10	9	7	8	6	8	9	9	6	8	0	0	4	7	3	5	0	0	55	64
23	3	8	7	7	5	9	4	9	10	10	6	10	10	8	10	8	7	5	0	0	62	74
24	8	10	6	8	2	10	8	8	2	6	4	8	4	4	8	10	3	6	0	0	45	70
25	6	8	0	7	7	9	9	8	3	1	6	5	0	0	10	10	2	0	0	0	43	48
26	3	6	6	10	1	4	2	9	10	5	8	5	8	6	8	9	7	5	0	0	53	59

TABLE 3

THE JOHNSON MOTOR-EDUCABILITY TEST SCORE SHEET

Class Motor Ability

	Test Trial																					
	1		2		3		4		5		6		7		8		9		10		TOTAL	
SUBJECT	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
1	9	9	0	8	0	9	6	10	6	10	6	4	4	5	8	2	4	4	0	0	43	61
2	5	10	10	9	7	9	7	9	4	7	8	9	0	0	10	10	5	4	0	0	56	67
3	2	9	1	10	9	8	1	7	10	9	8	10	8	6	8	10	8	6	0	0	55	75
4	10	7	10	8	8	10	2	9	10	10	8	10	0	2	4	9	6	5	0	0	58	70
5	9	9	9	9	8	6	4	10	4	4	4	6	0	0	4	9	2	2	0	0	44	55
6	9	8	10	9	0	3	9	10	2	6	6	6	0	0	2	10	2	2	0	0	40	54
7	4	8	3	7	4	5	3	0	2	3	8	8	2	4	8	5	2	4	0	0	36	44
8	9	8	6	9	2	6	6	4	6	10	0	5	2	6	8	8	2	6	0	0	41	62
9	9	9	10	10	1	8	9	10	4	10	8	4	0	5	8	10	2	8	0	0	51	74
10	7	7	0	8	6	8	0	7	10	9	4	10	6	8	6	10	4	8	0	0	43	75
11	10	9	3	9	3	1	8	8	4	10	4	10	0	9	6	10	0	8	0	0	38	74
12	8	8	0	5	0	1	7	9	8	6	8	9	0	3	4	8	3	3	0	0	38	52
13	4	8	10	10	2	4	0	9	10	6	8	8	6	3	6	10	6	6	0	0	52	64
14	8	9	2	5	4	9	0	2	2	7	6	10	0	0	6	5	2	1	0	0	30	48
15	9	10	0	7	4	8	0	6	4	6	6	10	0	6	10	10	0	4	0	0	33	67
16	8	9	9	9	4	9	9	10	10	10	4	7	8	10	8	8	10	10	0	0	70	82
17	7	10	0	8	7	8	0	4	2	4	4	6	0	0	6	6	0	3	0	0	26	49
18	6	9	10	10	1	1	8	8	8	10	2	6	4	7	10	8	5	5	0	0	54	64
19	6	9	6	10	8	8	4	1	10	8	8	8	6	6	8	10	4	5	0	0	60	65
20	10	7	7	10	0	8	0	6	8	8	6	9	6	10	10	10	6	8	0	0	53	76
21	8	9	10	9	3	8	7	9	8	9	8	9	2	7	8	8	4	8	0	0	58	76
22	10	10	9	8	1	4	6	10	5	5	10	9	4	5	8	10	4	3	0	0	57	64
23	9	10	3	10	6	6	7	10	8	10	8	8	6	8	6	10	6	9	0	0	59	81
24	8	8	9	9	6	10	6	6	5	5	6	8	3	4	10	10	5	2	0	0	58	62
25	4	10	3	6	0	6	4	9	4	9	8	10	1	2	10	5	1	4	0	0	35	61
26	6	10	2	3	2	5	0	6	0	0	2	6	0	0	6	2	0	0	0	0	18	32
27	10	10	8	10	1	3	8	8	6	8	8	7	8	6	8	8	8	9	0	0	65	69
28	9	10	9	10	9	10	2	10	10	10	8	6	8	7	8	10	6	7	0	0	69	80

TABLE 4

GYMNASTIC SKILLS RESULTS FOR THE CAPTAIN SELECT CLASS

Subject	Tumbling	Floor Exercise	Vaulting Cross Box	Vaulting Long Box	Spring Board	Total
1	1	9	5	6	3	32
2	4	6	5	3	3	21
3	9	10	6	4	8	37
4	6	7	5	8	8	34
5	12	7	5	8	6	38
6	5	6	9	4	2	26
7	1	7	0	2	2	12
8	10	4	5	6	4	29
9	8	8	3	5	6	30
10	6	7	7	5	3	28
11	13	12	7	4	7	43
12	5	6	8	4	3	26
13	7	1	5	6	7	26
14	5	6	7	5	4	27
15	5	6	6	5	4	26
16	5	8	5	4	3	25
17	8	10	6	4	4	32
18	4	4	5	4	3	20
19	4	8	4	8	4	28
20	5	5	7	5	2	24
21	4	3	8	4	2	21
22	7	6	9	5	1	28
23	4	6	9	7	2	28
24	12	10	7	3	7	39
25	12	8	5	9	6	40
26	11	10	6	5	5	37
Mean Score	29.12					

TABLE 5

GYMNASTIC SKILLS RESULTS FOR THE MOTOR ABILITY CLASS

Subject	Tumbling	Floor Exercise	Vaulting Cross Box	Vaulting Long Box	Spring Board	Total
1	5	7	8	3	3	26
2	5	14	10	3	3	35
3	11	14	9	6	3	43
4	6	11	5	2	3	27
5	0	5	5	3	1	14
6	4	3	4	1	1	13
7	0	4	2	3	0	9
8	4	2	2	5	0	13
9	4	9	3	5	0	21
10	11	8	9	3	3	34
11	1	7	2	3	0	13
12	5	5	0	1	1	12
13	7	5	9	3	3	27
14	4	7	0	2	4	17
15	7	8	0	7	4	26
16	12	13	11	4	0	40
17	3	2	2	3	0	10
18	9	8	8	3	3	31
19	12	12	10	8	9	51
20	9	9	0	6	4	28
21	6	3	8	5	1	23
22	5	11	5	0	0	21
23	5	16	10	5	5	41
24	8	6	0	7	4	25
25	2	2	5	3	1	13
26	0	8	2	3	0	13
27	5	11	6	0	3	25
28	15	15	11	6	6	53
Mean Score	25.14					

TABLE 6

TEST AND RE-TEST OF THE JOHNSON MOTOR-EDUCABILITY TEST

Captain Select Class

Subject	Test	Re-Test	Difference	Difference Squared
1	48	70	22	484
2	47	73	26	676
3	67	80	13	169
4	58	68	10	100
5	30	48	18	324
6	62	52	-10	100
7	22	59	37	1369
8	49	63	14	196
9	46	62	16	256
10	48	61	13	169
11	60	62	2	4
12	36	54	18	324
13	45	70	25	625
14	43	48	5	25
15	53	59	6	36
16	34	37	3	9
17	59	75	16	256
18	41	57	16	256
19	19	37	18	324
20	46	73	27	729
21	65	79	14	196
22	37	58	21	441
23	24	52	28	784
24	55	64	9	81
25	62	74	12	144
26	40	52	12	144
Sum of	1196	1587	391	8221

Mean Score of Test 46

Mean Score of Re-Test 61.04

THE SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS DERIVED FROM CORRELATED SCORES FROM SMALL SAMPLES

Between Test and Re-Test

Test: Johnson Motor-Educability

Class: Captain Select

$\Sigma D = 391$

$\Sigma D^2 = 8221$

$(\Sigma D)^2 = 152881$

$n = 26$

$$t = \frac{\Sigma D}{\sqrt{\frac{n\Sigma D^2 - (\Sigma D)^2}{n - 1}}}$$

$$t = \frac{391}{\sqrt{\frac{(26)(8221) - 152881}{26 - 1}}}$$

$$t = \frac{391}{\sqrt{2434.6}}$$

$$t = \frac{391}{49.34} = 7.92$$

$df = n - 1 = 25$

"t" value of 7.92 indicated significance at the .05 level (2.060) of confidence.

TABLE 7

TEST AND RE-TEST OF THE JOHNSON MOTOR-EDUCABILITY TEST

Subject	Motor Ability Class Test	Re-Test	Difference	Difference Squared
1	43	61	18	324
2	55	75	20	400
3	58	70	12	144
4	44	55	11	121
5	41	62	21	441
6	51	74	23	529
7	52	64	12	144
8	30	48	18	324
9	26	49	23	529
10	60	65	5	25
11	58	76	18	324
12	57	64	7	49
13	59	81	22	484
14	18	32	14	196
15	69	80	11	121
16	56	67	11	121
17	40	54	14	196
18	36	44	8	64
19	43	75	32	1024
20	38	74	36	1296
21	38	52	14	196
22	33	67	34	1156
23	54	64	10	100
24	53	76	23	529
25	58	62	4	16
26	35	61	26	676
27	65	69	4	16
28	70	82	12	144
Sum of	1340	1803	463	9689

Mean Score of Test 47.86

Mean Score of Re-Test 64.39

THE SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS DERIVED FROM CORRELATED SCORES FROM SMALL SAMPLES

Between Test and Re-Test

Test: Johnson Motor-Educability

Class: Motor Ability

$\Sigma D = 463$

$\Sigma D^2 = 9689$

$(\Sigma D)^2 = 214369$

$n = 28$

$$t = \frac{\Sigma D}{\sqrt{\frac{n\Sigma D^2 - (\Sigma D)^2}{n - 1}}}$$

$$t = \frac{463}{\sqrt{\frac{(28)\ (9689) - 214369}{28 - 1}}}$$

$$t = \frac{463}{\sqrt{2108}}$$

$$t = \frac{463}{45.91} = 10.08$$

$df = n - 1 = 27$

"t" value of 10.08 indicated significance at the .05 level (2.052) of confidence.

TABLE 8

TEST AND RE-TEST OF THE MODIFIED KNEER ATTITUDE INVENTORY

Captain Select Class

Subject	Test	Re-Test	Difference	Difference Squared
1	140	137	- 3	9
2	128	125	- 3	9
3	148	132	-16	256
4	170	157	-13	169
5	145	155	10	100
6	103	117	14	196
7	93	142	49	2401
8	131	136	5	25
9	125	117	- 8	64
10	130	130	0	0
11	143	146	3	9
12	143	132	-11	121
13	109	100	- 9	81
14	159	147	-12	144
15	123	135	12	144
16	130	138	8	64
17	142	137	- 5	25
18	131	123	- 8	64
19	114	113	- 1	1
20	140	119	-21	441
21	136	131	- 5	25
22	142	145	3	9
23	141	142	1	1
24	149	139	-10	100
25	111	128	17	289
26	141	145	4	16
Sum of	3467	3468	1	4763

Mean Score of Test 133.35

Mean Score of Re-Test 133.38

THE SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS DERIVED FROM CORRELATED SCORES FROM SMALL SAMPLES

Between Test and Re-Test

Test: Modified Kneer Attitude Inventory

Class: Captain Select

$\Sigma D = 1$

$\Sigma D^2 = 4763$

$(\Sigma D)^2 = 1$

$n = 26$

$$t = \frac{\Sigma D}{\sqrt{\frac{n\Sigma D^2 - (\Sigma D)^2}{n - 1}}}$$

$$t = \frac{1}{\sqrt{\frac{(26)(4763) - 1}{26 - 1}}}$$

$$t = \frac{1}{\sqrt{4953.48}}$$

$$t = \frac{1}{70.38} = .01$$

$df = n - 1 = 25$

"t" value of .01 indicated no significance at the .05 level (2.060) of confidence.

TABLE 9

TEST AND RE-TEST OF THE MODIFIED KNEER ATTITUDE INVENTORY

	Motor Ability Class			
Subject	Test	Re-Test	Difference	Difference Squared
1	129	124	- 5	25
2	131	134	3	9
3	135	147	12	144
4	126	125	- 1	1
5	127	137	10	100
6	141	129	-12	144
7	139	138	- 1	1
8	135	153	18	324
9	86	117	31	961
10	152	164	12	144
11	136	137	1	1
12	131	111	-20	400
13	90	127	37	1369
14	136	111	-26	676
15	130	106	-24	576
16	131	142	11	121
17	137	150	13	169
18	140	138	- 2	4
19	116	118	2	4
20	159	155	- 4	16
21	113	127	14	196
22	130	142	12	144
23	153	144	- 9	81
24	130	121	- 9	81
25	137	123	-14	196
26	133	137	4	16
27	170	171	1	1
28	138	143	5	25
Sum of	3711	3771	60	5929
Mean Score of Test		132.54		
Mean Score of Re-Test		134.68		

THE SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS DERIVED FROM CORRELATED SCORES FROM SMALL SAMPLES

Between Test and Re-Test

Test: Modified Kneer Attitude Inventory

Class: Motor Ability

$\Sigma D = 60$

$\Sigma D^2 = 5929$

$(\Sigma D)^2 = 3600$

$n = 28$

$$t = \frac{\Sigma D}{\sqrt{\frac{n\Sigma D^2 - (\Sigma D)^2}{n - 1}}}$$

$$t = \frac{60}{\sqrt{\frac{(28)(5929) - 3600}{28 - 1}}}$$

$$t = \frac{60}{\sqrt{6015.26}}$$

$$t = \frac{60}{77.56} = .77$$

$df = n - 1 = 27$

"t" value of .77 indicated no significance at the .05 level (2.052) of confidence.

TABLE 10

TEST OF THE JOHNSON MOTOR-EDUCABILITY TEST OF THE CAPTAIN SELECT CLASS AND OF THE MOTOR ABILITY CLASS

X_1 = Test Scores of the Captain Select Class
X_2 = Test Scores of the Motor Ability Class

Subject	X_1	X_1^2	X_2	X_2^2
1	48	2304	43	1849
2	47	2209	55	3025
3	67	4489	58	3364
4	58	3364	44	1936
5	30	900	41	1681
6	62	3844	51	2601
7	22	484	52	2704
8	49	2401	30	900
9	46	2116	26	676
10	48	2304	60	3600
11	60	3600	58	3364
12	36	1296	57	3249
13	45	2025	59	3481
14	43	1849	18	324
15	53	2804	69	4761
16	34	1156	56	3136
17	59	3481	40	1600
18	41	1681	36	1296
19	19	361	43	1849
20	46	2116	38	1444
21	60	3600	38	1444
22	50	2500	33	1089
23	65	4225	54	2916
24	37	1369	53	2809
25	24	576	58	3364
26	55	3025	35	1225
27	62	3844	65	4225
28	40	1600	70	4900
Sum of	1306	65523	1340	68812

Mean Score of X_1 = 46.64

Mean Score of X_2 = 47.86

THE SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM SMALL SAMPLES

Between the Captain Select Class and the Motor Ability Class

Test: Johnson Motor Educability

Captain Select Class $\Sigma X_1^2 = 65523$ $\Sigma X_1 = 1306$

$\overline{X_1} = 46.64$ $n_1 = 26$

Motor Ability Class $\Sigma X_2^2 = 68812$ $\Sigma X_2 = 1340$

$\overline{X_2} = 47.86$ $n_2 = 28$

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{n_1} + X_2^2 - \frac{(\Sigma X_2)^2}{n_2}}{n_1 + n_2 - 2} \left[\frac{1}{n_1} + \frac{1}{n_2}\right]}}$$

$$t = \frac{46.64 - 47.86}{\sqrt{\frac{65523 - \frac{(1306)^2}{28} + 68812 - \frac{(1340)^2}{28}}{28 + 28 - 2} \left[\frac{1}{28} + \frac{1}{28}\right]}}$$

$$t = \frac{-1.22}{\sqrt{12.29}}$$

$$t = \frac{-1.22}{3.500} = -.348$$

$df = (n_1 - 1) = (n_2 - 1) = 27 + 27 = 54$

"t" value of -.348 indicated no significance at the .05 level (2.008) of confidence

TABLE 11

RE-TEST OF THE JOHNSON MOTOR EDUCABILITY TEST OF THE CAPTAIN SELECT CLASS AND OF THE MOTOR ABILITY CLASS

X_1 = Re-Test Scores of the Captain Select Class
X_2 = Re-Test Scores of the Motor Ability Class

Subject	X_1	X_1^2	X_2	X_2^2
1	70	4900	61	3721
2	73	5329	75	5625
3	80	6400	70	4900
4	68	4624	55	3025
5	48	2304	62	3844
6	52	2704	74	5476
7	59	3481	64	4096
8	63	3969	48	2304
9	62	3844	49	2401
10	61	3721	65	4225
11	62	3844	76	5776
12	54	2916	64	4096
13	70	4900	81	6561
14	48	2304	32	1024
15	59	3481	80	6400
16	37	1369	67	4489
17	75	5625	54	2916
18	57	3249	44	1936
19	37	1369	75	5625
20	73	5329	74	5476
21	79	6241	52	2704
22	58	3364	67	4489
23	52	2704	64	4096
24	64	4096	76	5776
25	74	5476	62	3884
26	52	2704	61	3721
27			69	4761
28			82	6724
Sum of	1587	100247	1803	120071

Mean Score of X_1 = 61.04

Mean Score of X_2 = 64.39

THE SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM SMALL SAMPLES

Between the Captain Select Class and Motor Ability Class

Re-Test: Johnson Motor-Educability

Captain Select Class $\Sigma X_1^2 = 100247$ $\Sigma X_1 = 1587$

$\overline{X_1} = 61.04$ $n_1 = 26$

Motor Ability Class $\Sigma X_2^2 = 120071$ $\Sigma X_2 = 1803$

$\overline{X_2} = 64.39$ $n_2 = 28$

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{n_1} + \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{n_2}}{n_1 + n_2 - 2} \left[\frac{1}{n_1} + \frac{1}{n_2}\right]}}$$

$$t = \frac{61.04 - 64.39}{\sqrt{\frac{100247 - \frac{(1587)^2}{26} + 120071 - \frac{(1803)^2}{28}}{26 + 28 - 2} \left[\frac{1}{26} + \frac{1}{28}\right]}}$$

$$t = \frac{-2.35}{\sqrt{18.78}}$$

$$t = \frac{-2.35}{4.33} = -.54$$

$df = (n_1 - 1) + (n_2 - 1) = 25 + 27 = 52$

"t" value of -.54 indicated no significance at the .05 level (2.008) of confidence.

TABLE 12

TEST OF THE MODIFIED KNEER ATTITUDE INVENTORY OF THE CAPTAIN SELECT CLASS AND OF THE MOTOR ABILITY CLASS

X_1 = Test Scores of the Captain Select Class
X_2 = Test Scores of the Motor Ability Class

Subject	X_1	X_1^2	X_2	X_2^2
1	140	19600	129	16641
2	128	16384	131	17161
3	148	21904	135	18225
4	170	28900	126	15876
5	145	21025	127	16129
6	103	10609	141	19881
7	93	8649	139	19321
8	131	17161	135	18225
9	125	15625	86	7396
10	130	16900	152	23104
11	143	20449	136	18469
12	143	20449	131	17161
13	109	11881	90	8100
14	159	25281	136	18469
15	123	15129	130	16900
16	130	16900	131	17161
17	142	20164	137	18769
18	131	17161	140	19600
19	114	12996	116	13456
20	140	19600	159	25281
21	136	18469	113	12769
22	142	20164	130	16900
23	141	19881	153	23409
24	149	22201	130	16900
25	111	12321	137	18769
26	141	19881	133	17689
27			170	28900
28			138	19044
Sum of	3467	469684	3711	499705

Mean Score of X_1 = 133.35

Mean Score of X_2 = 132.54

THE SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM SMALL SAMPLES

Between the Captain Select Class and Motor Ability Class

Test: Modified Kneer Attitude Inventory

Captain Select Class $\Sigma X_1^2 = 469684$ $\Sigma X_1 = 3467$

$\overline{X_1} = 133.35$ $n_1 = 26$

Motor Ability Class $\Sigma X_2^2 = 499705$ $\Sigma X_2 = 3711$

$\overline{X_2} = 132.54$ $n_2 = 28$

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{n_1} + \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{n_2}}{n_1 + n_2 - 2}\left[\frac{1}{n_1} \quad \frac{1}{n_2}\right]}}$$

$$t = \frac{133.35 - 132.54}{\sqrt{\frac{469684 - \frac{(3467)^2}{26} + 499705 - \frac{(3711)^2}{28}}{26 + 28 - 2}\left[\frac{1}{26} \quad \frac{1}{28}\right]}}$$

$$t = \frac{.81}{\sqrt{43.47}}$$

$$t = \frac{.81}{6.59} = .12$$

$df = (n_1 - 1) + (n_2 - 1) = 25 + 27 = 54$

"t" value of .12 indicated no significance at the .05 level (2.008) of confidence.

TABLE 13

RE-TEST OF THE MODIFIED KNEER ATTITUDE INVENTORY OF THE CAPTAIN SELECT CLASS AND OF THE MOTOR ABILITY CLASS

X_1 = Re-Test Scores of the Captain Select Class
X_2 = Re-Test Scores of the Motor Ability Class

Subject	X_1	X_1^2	X_2	X_2^2
1	137	18769	124	15376
2	125	15625	134	17956
3	132	17424	147	21609
4	157	24649	125	15625
5	155	24025	137	18769
6	117	13689	129	16641
7	142	20164	138	19044
8	136	18469	153	23409
9	117	13689	117	13689
10	130	16900	164	26896
11	146	21316	137	18769
12	132	17424	111	12321
13	100	10000	127	16129
14	147	21609	111	12321
15	135	10225	106	11236
16	138	19044	142	20164
17	137	18769	150	22500
18	123	15129	138	19044
19	113	12769	118	13924
20	119	14161	155	24025
21	131	17161	127	16129
22	145	21025	142	20164
23	142	20164	144	20736
24	139	19321	121	14641
25	128	16384	123	15129
26	145	21025	137	18769
27			171	29241
28			143	20449
Sum of	3468	466929	3771	514705

Mean Score of X_1 = 133.38

Mean Score of X_2 = 134.68

THE SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS DRIVED FROM UNCORRELATED SCORES FROM SMALL SAMPLES

Between the Captain Select Class and Motor Ability Class

Re-Test: Modified Kneer Attitude Inventory

Captain Select Class $\Sigma X_1^2 = 466929$ $\Sigma X_1 = 3468$

$\overline{X_1} = 133.38$ $n_1 = 26$

Motor Ability Class $\Sigma X_2^2 = 514705$ $\Sigma X_2 = 3771$

$X_2 = 134.68$ $n_2 = 28$

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{n_1} + X_2^2 - \frac{(\Sigma X_2)^2}{n_2}}{n_1 + n_2 - 2} \frac{1}{n_1} \frac{1}{n_2}}}$$

$$t = \frac{133.38 - 134.68}{\sqrt{\frac{466929 - \frac{(3468)^2}{26} + 514705 - \frac{(3771)^2}{28}}{26 + 28 - 2} \left[\frac{1}{26} \frac{1}{28}\right]}}$$

$$t = \frac{-1.3}{\sqrt{33}}$$

$$t = \frac{-1.3}{5.74} = -.23$$

$df = (n_1 - 1) + (n_2 - 1) = 25 + 27 = 52$

"t" value of -.23 indicated no significance at the .05 level (2.008) of confidence.

TABLE 14

GYMNASTIC SKILLS SCORES OF THE CAPTAIN SELECT CLASS AND OF THE MOTOR ABILITY CLASS

X_1 = Scores of the Captain Select Class
X_2 = Scores of the Motor Ability Class

Subject	X_1	X_1^2	X_2	X_2^2
1	32	1024	26	676
2	21	441	35	1225
3	37	1369	43	1849
4	34	1156	27	729
5	38	1444	14	196
6	26	676	13	169
7	12	144	9	81
8	29	841	13	169
9	30	900	21	441
10	28	784	34	1156
11	43	1849	13	169
12	26	676	12	144
13	26	676	27	729
14	27	729	27	289
15	26	676	26	676
16	25	625	40	1600
17	32	1024	10	100
18	20	400	31	961
19	28	784	51	2601
20	24	576	28	784
21	21	441	23	529
22	28	784	21	441
23	28	784	41	1681
24	39	1521	25	625
25	40	1600	13	169
26	37	1369	13	169
27			25	625
28			53	2809
Sum of	757	23293	704	21792

Mean Score of X_1 = 29.12

Mean Score of X_2 = 25.14

THE SIGNIFICANCE OF DIFFERENCE BETWEEN MEANS DERIVED FROM UNCORRELATED SCORES FROM SMALL SAMPLES

Between the Captain Select Class and Motor Ability Class

Test: Gymnastic Skills Achievement

Captain Select Class $\Sigma X_1^2 = 23295$ $\Sigma X_1 = 757$

$\overline{X_1} = 29.12$ $n_1 = 26$

$\Sigma X_2^2 = 21792$ $\Sigma X_2 = 704$

$\overline{X_2} = 25.14$ $n_2 = 25.14$

$$t = \frac{\overline{X_1} - \overline{X_2}}{\frac{\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{n_1} + \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{n_2}}{n_1 + n_2 - 2} \left[\frac{1}{n_1} + \frac{1}{n_2}\right]}$$

$$t = \frac{29.12 - 25.14}{\frac{23293 - \frac{(757)^2}{26} + 21792 - \frac{(704)^2}{28}}{26 + 28 - 2} \left[\frac{1}{26} + \frac{1}{26}\right]}$$

$$t = \frac{3.98}{15.25}$$

$$t = \frac{3.98}{3.91} = 1.02$$

$df = (n_1 - 1) + (n_2 - 1) = 25 + 27 = 52$

"t" value of 1.02 indicated no significance at the .05 level of confidence.

TABLE 15

TEST AND RE-TEST OF THE MODIFIED KNEER ATTITUDE INVENTORY

Subject	Experimental Group X = Test Scores Y = Re-Test Scores X	X^2	Y	Y^2	XY
1	127	16129	136	18469	17272
2	104	10816	86	7396	8944
3	124	15376	122	14884	15128
4	145	21025	145	21025	21025
5	95	9025	104	10816	9880
6	140	19600	141	19881	19740
7	130	16900	131	17161	17030
8	148	21904	138	19044	20424
9	67	4489	59	3481	3953
10	140	19600	143	20449	20020
11	154	23716	147	21609	22638
12	157	24649	157	24649	24649
13	155	24025	144	20736	22320
14	135	18225	140	19600	19900
15	97	9409	99	9801	9603
16	96	9216	98	9604	9408
17	110	12100	121	14641	13310
18	125	15625	116	13456	14500
19	81	6561	78	6084	6318
20	103	10609	86	7396	8858
21	152	23104	159	25281	24168

TABLE 15--Continued

Subject	Experimental Group X = Test Scores Y = Re-Test Scores X	X^2	Y	Y^2	XY
22	115	13225	122	14884	14030
23	124	15376	105	11025	13020
24	116	13456	115	13225	13340
25	141	19881	132	17424	18612
26	138	19044	141	19881	19458
27	115	13225	110	12100	12650
28	119	14164	103	10609	12257
29	117	13689	121	14641	14157
30	146	21316	155	24025	22630
31	90	8100	87	7569	7830
32	99	9801	108	11664	10692
33	139	19321	132	17424	18348
34	93	8649	90	8100	8370
35	156	24336	158	24965	24648
36	106	11236	115	13225	12190
37	124	15376	133	17689	16492
38	165	27225	168	28224	27720
39	128	16384	134	17956	17152
40	83	6889	79	6241	6557
41	102	10404	102	10404	10404
42	135	18225	141	19881	19035
43	131	17161	130	16900	17030
44	149	22201	147	21609	20903
45	108	11664	109	11881	11772
46	112	12544	103	10609	11536
47	107	11449	105	11025	11235
48	135	18225	144	20736	19440
49	126	15876	122	14884	15372
50	96	9216	105	11025	10080
Sum of	6100	769761	6066	765287	766048

COEFFICIENT OF CORRELATION OF RELIABILITY OF THE MODIFIED KNEER ATTITUDE INVENTORY

r = correlation coefficient symbol

ΣX	= 6100	ΣY	= 6066
ΣX^2	= 769761	ΣY^2	= 765287
ΣXY	= 766048	n	= 50

$$r = \frac{\Sigma XY - \frac{(\Sigma X)(\Sigma Y)}{n}}{\left[\Sigma X^2 - \frac{(\Sigma X)^2}{n}\right]\left[\Sigma Y^2 - \frac{(\Sigma Y)^2}{n}\right]}$$

$$r = \frac{766048 - \frac{(6100)(6066)}{50}}{\left[769761 - \frac{(6100)^2}{50}\right]\left[765287 - \frac{(6066)^2}{50}\right]}$$

$$r = \frac{25996}{750470960}$$

$$r = \frac{25996}{27395} = .949$$

SELECTED BIBLIOGRAPHY

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Books

Brace, David Kingsley. Measuring Motor Ability. New York: A. S. Barnes and Company, 1927.

Garrett, Henry E. Statistics in Psychology and Education. New York: Longmans, Green and Company, 1968.

Gire, John C., and Espenshade, Mark L. Measurement in Physical Education and Recreation. New York: Harper and Brothers, 1942.

Keeney, Charles J. Fundamental Tumbling Skills Illustrated. New York: The Ronald Press Co., 1966.

Larson, Leonard A. Measurement and Evaluation in Physical Education and Recreation Education. St. Louis: The C. V. Mosby Company, 1951.

Loken, Newton C., and Willoughby, Robert J. A Complete Book of Gymnastics. Englewood Cliffs, N. J.: Prentice Hall Inc., 1959.

McCloy, C. M. Tests and Measurements in Physical Education. New York: F. S. Crofts, 1942.

McCloy, Charles H., and Young, Norma D. Tests and Measurements in Health and Physical Education. New York: Appleton-Century-Crofts, Inc., 1954.

McNemar, Quinn. Psychological Statistics. New York: John Wiley and Sons, Inc., 1949.

Price, Hartly D., Keeney, Charles, Giallombardo, Joseph, and Phillips, Chester W. Gymnastics and Tumbling. Menasha, Wisconsin: The George Banta Company Inc., 1961.

Thurstone, Louis Leon. The Measurement of Values. Chicago: University of Chicago Press, 1959.

Periodicals

Adams, Phillip C., Jr. "Ability Grouping in Junior High." Journal of Health, Physical Education and Recreation, XXXV (May, 1964), 83.

Adams, R. S. "Two Scales of Measuring Attitude Toward Physical Education." Research Quarterly, XXXV (March, 1963), 93.

Alden, Mabel Avis. "The Factors in the Required Physical Education Program That are Least Attractive to the College Girl." Research Quarterly, III (December, 1932), 97-107.

Anderson, Theresa, and McCloy, C. H. "The Measurement of Sports Ability in High School Girls." Research Quarterly, XVIII (March, 1947), 10.

Carpenter, Aileen. "Factors in Motor Educability." Research Quarterly, XIV (December, 1943), 366.

Carr, Martha G. "The Relationship Between Success in Physical Education and Selected Attitudes Expressed by High School Freshman Girls." Research Quarterly, XVI (October, 1945), 171-191.

Committee on Exercise and Physical Fitness of the American Medical Association. "Classification of Students for Physical Education." Journal of Health, Physical Education and Recreation, XXXVIII (February, 1967), 16.

Feely, Martin J. "Ability Grouping." Journal of Health, Physical Education and Recreation, XXXII (November, 1961), 18.

Fulton, Ruth E. "Relationship Between Teammate Status and Measures of Skill in Volleyball." Research Quarterly, (October, 1950), 274-276.

Johnson, Granville B. "Physical Skill Tests for Sectioning Classes into Homogeneous Units." Research Quarterly, III (March, 1932), 128-136.

Keogh, Jack. "Extreme Attitudes Toward Physical Education." Research Quarterly, XXXV (March, 1953), 27-33.

Keogh, Jack. "Analysis of General Attitudes Toward Physical Education." Research Quarterly, XXXIII (May, 1962), 239.

Mott, Kenneth. "The Case for 'Ability Grouping'." Bulletin of the National Association of Secondary School Principals, LXV (November, 1961), 263.

Narowetz, Janet, Leso, Ami, Vodola, Tom, Hellman, Bill, and Piscope, John. "Gymnastics." Journal of Health, Physical Education and Recreation, XXXV (October, 1964), 21.

Paulin, Mary. "Girls Hate P.E." Times Educational Supplement, (September, 1966), 18.

Schreiber, Daniel. "The Low Ability Group and the World of Automation." Bulletin of the National Association of Secondary School Principals, LXVIII (November, 1964), 81.

Snyder, Raymond A. "The Gifted Student and Physical Education." Journal of Health, Physical Education and Recreation, XXXIII (January, 1962), 18.

Stalnaker, John M. "Attitudes Toward Intercollegiate Athletics." School and Society, XXXVII (April, 1933), 504.

Vincent, Marilyn E. "Prediction of Success in Physical Education Activities from Attitude, Strength and Efficiency Measurements." Research Quarterly, XXXVIII (October, 1967), 505.

Wear, Carlos Leon. "The Evaluation of Attitude Toward Physical Education as an Activity Course." Research Quarterly, XXII (March, 1951), 122.

Wessell, Janet A., and Nelson, Richard. "Relationship Between Strength and Attitudes Toward Physical Education Activity Among College Women." Research Quarterly, XXXV (December, 1964), 562-569.

Whildes, Peggy P. "Comparison of Two Methods of Teaching Beginning Basketball." Research Quarterly, (May, 1956), 235.

Williams, F. Neil. "Physical Activities for All--Even the Uninterested." School Activities, XXXV (March, 1964), 209.

Unpublished Materials

Allerdice, Mary Ellen. "The Relationships Between Attitude Toward Physical Education and Physical Fitness Scores and Sociometric Status." Unpublished master's thesis, State University of Iowa, 1963.

Broer, Marion Ruth. "A Critical Evaluation of a General Basic Skills Curriculum for Students of Low Motor Abilities at the University of Washington." Unpublished Ph.D. dissertation, New York University, 1954.

Collins, Arden. "The Democratic Method Versus the Test Score Method of Assigning Players and Captains and the Effects Upon Satisfactory Group Relations." Unpublished master's thesis, University of North Dakota, 1960.

Davis, Rex S. "Placement of Selected Tumbling and Balance Stunts in the Elementary School Physical Education Program." Unpublished master's thesis, Washington State University, 1961.

Frost, Ardith Bernice. "The Relationships Between a Volleyball Test and Student's Choices of Teammates and Friends." Unpublished master's thesis, University of California, 1947.

Hill, Rose M. "Educational Gymnastics for the Teacher of Physical Education." Unpublished master's thesis, University of Iowa, 1962.

Humiston, Dorothy. "A Measurement of Motor Ability in College Women." Unpublished Ph.D. dissertation, New York University, 1936.

Kneer, Marion Elizabeth. "The Adaptation of Wear's Physical Education Attitude Inventory for Use With High School Girls." Unpublished master's thesis, Illinois State Normal, 1956.

Longmuir, Gordon. "A Comprehensive Study of Tumbling and Gymnastics Skills Instruction Involving Fifth and Sixth Grade Boys and Girls in Benjamin Franklin Elementary School." Unpublished master's thesis, University of North Dakota, 1967.

Sullivan, Maureen. "A Comparison of Attitudes and General Motor Ability of Plant High School Sophomore Girls Between Homogeneously Grouped Students of High and Low Motor Abilities. Unpublished master's thesis, University of North Dakota, 1968.

Wear, Carlos Leon. "The Construction and Application of an Instrument for the Evaluation of Attitudes Toward Physical Education as an Activity Course." Unpublished Ph.D. dissertation, University of Iowa, 1950.

Wickstrom, Ralph L. "A Comparative Study of the Methodologies for Teaching Gymnastics and Tumbling." Unpublished master's thesis, University of Iowa, 1952.