AN APPROACH TO TESTING AND TEACHING IN ELEMENTARY GYMNASTICS FOR SECONDARY SCHOOL BOYS

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by

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O. J. W.

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CHAPTER I

INTRODUCTION

In many areas throughout the country interest in the sport of gymnastics is growing with an impetus that far exceeds the interest shown before World War II. The trend toward competitive gymnastics in the Y. M. C. A.'s, colleges, high schools, and clubs has been tremendous. In the South the sport is still comparatively new in the public school systems because of the lack of facilities and equipment. There is therefore a definite need for research, experimentation, and an effective testing program in the field of competitive gymnastics, as well as in the gymnastic program of the physical education classes at the secondary school level.

I. THE PROBLEM

Statement of the problem. It was the purpose of this study (1) to develop an experimental teaching program in beginning gymnastics for high school boys; (2) to show the relationship between selected fitness test items and the gymnastic abilities demonstrated at the end of the experimental program; and (3) to suggest areas for future research in gymnastics teaching and testing.

Importance of the study. Since the publication of the results of the Kraus-Weber Test of Minimum Muscular Fitness, there has been a great deal of emphasis placed on physical fitness, and indirectly on gymnastics. John Piscopo, gymnastic coach at Northwestern State College in Louisiana, stated that:

> Now is the opportune time to add the long-forgotten sport of gymnastics to our programs of physical education. With an ever-increasing awareness of physical fitness as an objective, high school and college instructors find an excellent climate for beginning gymnastics, tumbling, and trampoline activities. Gymnastics contributes immeasurably to the realization of the physical fitness goal.[1]

The progress of gymnastics in the secondary schools of the South has been retarded somewhat by the lack of space, time, facilities, equipment, and trained leadership. Because of these conditions it is important that the interest be kept at a high level. This study was undertaken to point out one approach to maintaining this interest.

II. DEFINITIONS OF TERMS USED

Stick balance. The stick balance test, which is an elementary test of balance, requires sticks one inch by one inch by twelve inches. Two positions are timed: the first

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[1]John Piscopo, "Start Your Gymnastic Program Now," Journal for Health and Physical Education, 29:10, February, 1958.

while standing on one foot lengthwise on the stick and the second while standing on the ball of one foot crosswise on the stick.

Dips. A dip is a test of arm, shoulder, chest, and upper back strength. From a straight arm support on the parallel bars, the subject lowers his body until the arms are at a right angle at the elbow. Then he straightens the arms to a straight arm support.

Pull-ups. Pull-ups measure upper arm and shoulder area strength. The participant hangs by his hands with an overhand grasp from a horizontal bar. The body is pulled upward until the chin is even with the hands or over the bar. Then he lowers the body until the arms are straight. The subject is not permitted to touch the ground or to kick the legs on the pull-up.

Leg lifts. Leg lifts test the endurance of the abdominal and thigh areas. The subject starts from a hanging position on the horizontal bar. He raises the legs, which are completely extended, until they are parallel to the floor; he then lowers the legs. This test must be performed without a swing.

Squat thrusts. Squat thrusts are used to measure agility. The starting position is that of attention.

The subject lowers the body to a squat with the feet together, knees apart, and the hands on the floor in front of the feet. The legs are thrust backward to the front leaning-rest position. He then returns to the squat position, followed by a return to the standing position.

III. NOMENCLATURE OF GYMNASTIC APPARATUS[2]

Horizontal bar. A horizontal bar is a steel bar parallel to the floor and supported by two uprights. The bar is adjustable as to height. (Regulation--8' to 8'3".)

Parallel bars. Parallel bars are two wooden bars parallel to the floor and supported by four uprights connected to a steel frame. The width and height of the bars are usually adjustable. Regulation parallel bars are about 5' high and 10' long.

Side horse. A side horse is a leather covered cylindrical body about 14 inches in diameter. It is supported by uprights attached to a steel frame. There are two pommels (handles) near the center. The part to the left of the pommels is the neck, between the pommels is the saddle, and to the right of the pommels is the croup.

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[2]Otto E. Ryser, A Teacher's Manual for Tumbling and Apparatus Stunts (Dubuque, Iowa: Wm. C. Brown Co., 1951), p. 21.

Mats. A mat is a plastic covered pad stuffed with rubberized hair. It is 4 feet wide, 8 feet long, and about 3 inches thick.

Trampoline. A trampoline is a spring suspended, webbed nylon matting or surface supported by a steel frame.

IV. ORGANIZATION OF THE REMAINDER OF THE THESIS

The second chapter reviews briefly the literature related to this study. Chapter III describes the procedures used in the testing program, while the fourth chapter is concerned with the procedure for the teaching unit in gymnastics. Chapter V analyzes the data collected as a result of the testing program. A summary of the results of the study and conclusions constitute Chapter VI, which is followed by the bibliography and the appendix.

CHAPTER II

REVIEW OF THE LITERATURE

Three sources that the writer found most helpful in this study were as follows: Otto Ryser's A Teacher's Manual for Tumbling and Apparatus Stunts;[1] Wilbur West's book, The Gymnast's Manual;[2] and the naval aviation physical training manual, Gymnastics and Tumbling.[3] All three showed a progression unit of stunts on each piece of apparatus as well as on the tumbling mats. Ryser's manual, however, was more applicable to the teaching of gymnastics in the secondary school physical education program. His manual also included teaching limits and safety precautions in the explanation of each stunt. There was a noticeable lack of testing or test procedures in the area of gymnastics in each of the three books reviewed.

This same lack of material in the area of gymnastic tests for secondary school physical education programs was also noted by the writer in the general literature concerned with gymnastic programs. Some research has been done at the

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[1]Otto E. Ryser, A Teacher's Manual for Tumbling and Apparatus Stunts (Dubuque, Iowa: Wm. C. Brown Co., 1951).

[2]Wilbur D. West, The Gymnast's Manual (New York: Prentice-Hall, Inc., 1947).

[3]V-5 Association of America, Gymnastics and Tumbling (Annapolis, Maryland: The United States Naval Institute, 1950).

college level in the area of testing gymnastic ability.

Wettstone,[4] when working with his problem of determining potential gymnastic ability, had three definite objectives in mind: (1) to compile a list of the innate and the acquired qualities that a good all-round gymnast should possess; (2) to devise tests that will measure the degree and amount of such qualities in any individual; and (3) to set up a working formula that can be used as a measuring rod.

A list of qualities which it was thought a good gymnast would possess was compiled and sent to twenty-five of the country's outstanding coaches and gymnasts. These authorities ranked the qualities according to importance. Tests for ten of the highest ranking qualities were obtained. They were the following:

1. Interest and determination

   Each student filled out a questionnaire which gave an indication of the interest and determination.

2. Physical courage

   Students were given the Smedley-Grip Dynamometer Test.

3. Coordination, quickness, and precision of movements

   The Burpee Test was administered.

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[4]Eugene Wettstone, "Tests for Predicting Potential Ability in Gymnastics and Tumbling," Research Quarterly, 4: 115-127, December, 1938.

4. Strength

Tests used were number of pull-ups, dips, and leg lifts each student could do.

5. Kinesthetic sense and semi-circular canal function

This test consisted of three parts. The first dealt with the relationship of one part of the body to another. The second dealt with the relationship of nearby objects to the body. The third part consisted of inverted hangs on the rings.

6. Condition of the heart

All subjects received medical examinations which reported heart normal before the time of testing.

7. Flexibility

Three measures of flexibility were taken: (1) in the shoulder girdle, (2) forward trunk flexion, and (3) flexibility of the back. The formula used for finding flexibility was: $\frac{\text{shoulder flexion}}{\text{span}}$ -

$\frac{\text{abdominal flexion}}{\text{height}} + \frac{\text{back extension}}{\text{height}} = \text{flexibility score.}$

8. Timing and sensory rhythms

The Seashore Test which measures musical talent was used for this purpose.

9. Motor rhythm

An addition to the Seashore motor rhythm unit by H. M. Williams, a new apparatus for testing motor rhythm, was used.

10. Motor educability

Two tests were administered: the Johnson Test and the Hill Tests of Motor Educability.

Wettstone also used the following eleven anthropometric measurements:

1. Weight
2. Height
3. Span
4. Length of humerus
5. Length of radius
6. Circumference of the chest
7. Circumference of the upper arm
8. Circumference of the forearm
9. Circumference of the thigh
10. Circumference of the calf
11. Grip measurement (endurance)

From the data that he collected, Wettstone constructed a test which consisted of three elements: $\frac{\text{thigh circumference}}{\text{height}}$; strength test (consisting of chinning, dipping, and thigh flexion); and the Burpee Test, which predicted potential ability in gymnastics with a multiple correlation of .79 by means of a regression equation. This equation may be stated

as follows:

$$X_0 = -.355X_1 + .260X_2 + .035X_3 + 13.990$$

The terms of the preceding equation are explained as follows:

X_0 . . . . . Gymnastic ranking

X_1 . . . . . $\frac{\text{Thigh circumference}}{\text{Height}}$

X_2 . . . . . Burpee test score

X_3 . . . . . Strength score

In conclusion, Wettstone stated:

> An objective test for the measuring of potential gymnastic ability has been presented which does not require the use of expensive apparatus and which is easily administered.
>
> It is believed that this test should not be used to cut down a squad, segregating good from poor, but that it should be used to encourage people to come out for gymnastics and tumbling who have "what it takes" to be good. There are many boys who would like to win their letter in some sport, but lack the weight or speed which is so greatly required in sports such as football, basketball, baseball, track, and the like.
>
> Many boys can be encouraged to try gymnastics, especially if their scores in the predictive tests run high.
>
> It should also be remembered that a test with a multiple correlation of .79 is not a perfect test, and relatively low test scores should not be used to discourage any person who is interested. The test is primarily a finding device.[5]

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[5] Ibid., pp. 124-5.

Zwarg,[6] in his analysis of judging gymnastic competition, breaks his report into four divisions: (A) The Nature of Competitive Apparatus Work; (B) The Qualifications for Judging; (C) Guides in Evaluating a Performance on the Apparatus; (D) Proposed Rules Governing Competition of Apparatus Work.

When working on this report Zwarg went to the latest sources, practices, and ideas in Europe and the United States. By way of summarizing Zwarg's four main divisions, the following resume concerning each is given.

(A) The Nature of Competitive Apparatus Work. Evaluating gymnastic work is very difficult. Each judge sees the gymnast through different impressions. One may follow the ups and downs, another may take total impression only, and a third may look for a critical point or climax in the exercise. Judgments are recorded as excellent, very good, good, and poor, or in point values from one to five, or one to ten, or one to one hundred. There are no differences in the number scales except that the higher scale or gradations should be used in a high class meet where the very finest gradations are needed.

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[6]Leopold F. Zwarg, "Judging and Evaluation of Competitive Apparatus or Gymnastic Exercise," Journal of Health and Physical Education, 6:23-25, 48-49, January, 1935.

(B) Qualifications for Judging. A good judge must have personal as well as technical qualifications. Personal qualifications desirable are that he be reliable, punctual, and practical. He must be able to pay close attention to what he is judging and disregard that which goes on around him. He must be just and impartial. He must have sufficient technical training and experience. He must also have tact and the willingness to listen to others. When judging he should be helpful and cooperative, qualities which will sometimes relax the competitors. The technical qualifications of a good gymnastic judge would be that he have a good background in gymnastics, one filled with rich experience and knowledge. Having been a competitor would help, but it is not absolutely necessary. The judge must be familiar with all rules, especially ones that have been changed or added.

(C) Guides in Evaluating a Performance on the Apparatus. The exercise should be judged from four different criteria:

(a) Correct execution

(b) Beauty of execution

(c) Difficulty of the parts

(d) Combination and composition

The last division is omitted in this review because in the opinion of the writer it did not pertain to this study.

In summarizing the judging of gymnastic competition, Zwarg felt that the following characteristics should be mentioned about the gymnastic meet and what the competent judge should look for. The whole performance of the gymnast should be a pleasing composition possessing unity, fluency, and dramatic quality. It should be an artistic action. The exercises should not contain needless rests, intermediate swings, blundering, or unnatural movements. One part of the routine should show originality or personality on the part of the competitor.

Zwarg recommended that each apparatus exercise should be graded on a basis of zero to one hundred points as follows:

Excellent----------ninety to one hundred

Good----------seventy to eighty

Fair----------fifty to sixty

Poor----------thirty to forty

If no attempt is made to show an exercise, no points shall be given.

In a study to determine the relation of structural measures and functional measures to success in several sports, Dr. Di Giavanna[7] found many things peculiar to gymnasts. He found that gymnasts exhibit real differences from the

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[7]Vincent Di Giavanna, "The Relation of Selected Structural and Functional Measures to Success in College Athletics," Research Quarterly, 14:199-226, May, 1943.

normal group of athletes. They are smaller in height, leg length, hip breadth, and arm span; they are greater in arm girth, right grip, back force, leg force, arm pull, arm push, total force, vertical jump, and greater explosive power. They are asymmetrical, with a very atypical structural and functional pattern. They are shorter, more muscular, stronger, and much more powerful than the average student.

CHAPTER III

PROCEDURE

Selection of subjects. The subjects were members of a tenth grade required physical education class at the Miami Senior High School. The class had forty-one members. None of the group had ever had experience in gymnastics or on gymnastic equipment or apparatus. The investigator had no selection rights or privileges as to who the members of the group would be.

Procedure followed. Before administering a test on gymnastics, the writer felt that it was important to get the group being tested as near to their best physical condition as possible. The reason for this was to give each student an equal opportunity to achieve his highest level of physical performance. The program selected to get the class to this high level of fitness was a six-week physical fitness program. The students participating in this program were informed of the study being made and their part in it. All of the students agreed to give their wholehearted support and cooperation in carrying out the study.

The six-week physical fitness program consisted of the following series of activities:

1. A ten-minute warm-up period, consisting of calisthenics selected by the class at the beginning of each class period
2. Pull-ups
3. Push-ups
4. Sit-ups
5. Standing broad jump
6. Vertical jump
7. 100-yard dash
8. Mile run

At the end of this six-week period the group was tested and their best results recorded. It was the subjective judgment of the writer that at the time the subjects were tested they were in good physical condition and ready to continue on to the gymnastic unit.

First test. The first two periods of the gymnastic unit were devoted to the administration of the fitness test. This test consisted of the following:

Item	Factor Measured
1. Chin-ups	Muscular strength and endurance
2. Dips	Muscular strength and endurance
3. Balance test	Balance
4. Leg lifts	Muscular strength and endurance
5. Squat thrusts	Agility

The reasons for selecting the above items as tests for fitness in gymnastics were threefold: (1) According to common findings the reliability and objectivity of these particular components have been found to be significant.[1] (2) Wettstone, in his test for predicting potential gymnastic ability, used four of these five test items and found them to be important in gymnastic measurement. (3) Through past experience as a gymnast, the writer felt that all of these particular items were important.

The chin-ups and dipping items as tests for muscular strength and endurance have a reliability and objectivity correlation coefficient of .90 and above, according to common findings, while the leg lift item has a correlation coefficient between .80 and .90. As a test of agility the squat thrust is rated below .80. The correlation coefficient for reliability that has been obtained for the stick test runs from .8 to .9.[2]

The chin-ups, dips, and leg lifts were scored by counting the highest number attained without a limit of time except that they must be continuous. The squat thrust and the balance test items both had a time limit of one minute.

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[1]Leonard A. Larson and Rachael D. Yocom, Measurement and Evaluation in Physical, Health, and Recreation Education (St. Louis: C. V. Mosby Co., 1951), p. 163.

[2]Charles H. McCloy and Norma D. Young, Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, Inc., 1954), p. 104.

Administrative procedures used in giving the fitness test were as follows:

First period (All periods were 45 minutes in length.)

(1) The group was divided into two equal groups, A and B.

(2) Group A was given the dip test and the leg lift test; Group B kept count and recorded the scores.

(3) Group B was given the dip test and the leg lift test; Group A kept count and recorded the scores.

Second period

(4) Group A was given the pull-up test and the balance test; Group B kept count and recorded the scores.

(5) Group B was given the pull-up test and the balance test; Group A kept count and recorded the scores.

(6) Both groups were given the squat thrust test. While one group took the test, the other counted and then they changed about. The scores were recorded after both groups had finished the test.

Gymnastic training unit. At the end of the two periods used for testing, a thirty-period unit followed on elementary gymnastics (45 minutes per day). The apparatus consisted of the following pieces: side horse, parallel bars, horizontal bar, tumbling mats, and the trampoline. Twenty class periods

were spent on basic elementary individual stunts on the apparatus. The last ten class periods were spent putting together the individual stunts learned on each piece of apparatus into a routine or continuity of stunts. The purpose of this second phase of the unit was to determine whether or not the students had the ability to organize their stunts and abilities into a competitive gymnastic situation. The teaching method during the entire program was by demonstration. Individual help was given when it was needed.

Second test. After having completed the thirty class periods of gymnastic instruction and practice, a competitive gymnastic situation was set up in which each of the forty-one subjects was judged on his gymnastic ability under a competitive situation. Three competent unbiased judges were used to judge the students. They were judged on each piece of gymnastic apparatus in order to evaluate their all-round ability. The score was on the basis of ten for perfect down to zero for no ability whatsoever. The scores of the three judges were added together and averaged for the total score for each individual on each piece of apparatus. For example, if a boy received scores of 7, 8, and 9 from the three judges on the horse, his total score for his routine on that piece of apparatus would be 8.

CHAPTER IV

PROCEDURE USED IN TEACHING THE ELEMENTARY GYMNASTIC PROGRAM

It was the purpose of this chapter to give the objectives of the gymnastic unit as well as to describe the teaching procedure. It was not the writer's purpose or intention to prescribe any set method or technique for teaching gymnastics. For a more detailed and authoritative procedure, the writer recommends Otto Ryser's Teaching Manual for Tumbling and Apparatus Stunts.[1]

Objectives. In setting up the objectives for this program, the writer found that there are many. The most important ones, in the opinion of the writer, are listed below.

1. To create an interest in gymnastics as a sport and broaden the student's sport scope.
2. To make available to students who are not physically equipped to play other sports the chance to succeed at gymnastics.
3. To promote individual health through vigorous muscular activity involving all parts of the body.
4. To develop to some degree strength, endurance, agility, flexibility, and balance.

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[1]Otto E. Ryser, A Teacher's Manual for Tumbling and Apparatus Stunts (Dubuque, Iowa: Wm. C. Brown Co., 1951).

Class organization.[2] The rotating squad method was used in the organization of the class. In this method each squad works independently of the others and is under the direction of a squad leader. The squad leader was picked by the instructor because of his natural ability, athletic prowess, and his dependability. At the beginning of each class period the instructor demonstrated the activity for the period on each piece of apparatus. Demonstrations of the safety devices and precautions were also stressed. The squad leader was in complete charge of his squad. As each member of his squad successfully completed the stunt to be learned, the squad leader checked this on his progress sheet.

At a signal from the instructor, the squad leader would move his squad on to the next piece of apparatus. For example, Squad A on Monday would begin the class period on the tumbling mats. After about fifteen minutes, at a signal from the instructor, they would move on to the side horse. At the end of another fifteen minutes, at a signal from the squad leader, they would move on to the parallel bars until the end of the class period. When Squad A began on Tuesday, they would continue their circuit to the horizontal bars, then on to the trampoline, and finally back to the tumbling mats.

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[2] Ibid., p. 13.

In this manner everyone worked on three different pieces of equipment every class period. With the squad leaders as teacher assistants, the instructor was left free to work with any individuals who might be having particular difficulty, or in any situation that the squad leader could not handle alone.

On each piece of gymnastic equipment the proper warm-up and safety precautions were stressed as well as the proper progression of stunts.

The progression unit taught on the apparatus and tumbling mats was as follows:

TUMBLING

- Forward roll
- Variations of the forward roll
- Backward roll
- Combination forward and backward roll
- Cartwheel
- Back extension
- Round off
- Kip
- Tip up
- Head stand
- Hand spring

SIDE HORSE

- Vaults

Vaults (continued)

Squat

Flank

Front

Side

Rear

Straddle

Courage

Thief

Wolf

Supports

Front

Rear

One half single leg circles and return

Single leg circles

Simple traveling

PARALLEL BARS

Straight arm support

Forward hand walk

Forward hand jump

Backward hand walk

Swing

Swing to straddle seat

Swing to a flank dismount

Swing to a front dismount

PARALLEL BARS (continued)

Swing to a rear dismount

Straddle seat back roll straddle seat

Straddle seat forward roll straddle seat

Forward roll

Kip

Uprise

Combinations of above

HORIZONTAL BAR

Skin the cat

Front pull over

Single knee mount

Forward roll

Underwing dismount

Back swing dismount

Combinations of the above

TRAMPOLINE

Bounce

Turns

Seat drop

Knee drop

Back drop

Front drop

Variations and combinations of the above

It should be pointed out that some of the students advanced in their progression much farther than the above named fundamentals. For example, a great number were able to do somersaults on the trampoline. Although not required, such activities were taught if the student was ready for them and capable of performing them.

At the culmination of the thirty-period gymnastic unit, an evaluation or judging took place under gymnastic meet conditions. Points were awarded with a possible score range from zero to ten on each piece of apparatus.

It was the opinion of the writer that all students concerned received an all-round experience in gymnastics through the rotation method used in the class procedure. Each student received about 270 minutes, or 4½ hours, of time on each piece of apparatus. The class was divided into five squads, with eight boys in a squad. The squad leaders, who were very valuable in the program, stayed after class each day for five or ten minutes in order to become acquainted with the material that would be taught the following day. Such things as hints or techniques for spotting or demonstrating were taught and discussed at this time.

CHAPTER V

STATISTICAL ANALYSIS OF DATA

To determine the relationship of gymnastic success to the fitness test which was administered to the forty-one boys at the beginning of the teaching unit, the writer used a rank-difference method of correlation. This technique is a statistical concept designed to correlate differences that cannot be measured accurately, but which can be ranked. In the Rho correlation only the position of the items (in this case T scores) are taken into consideration. A rank of 1 is given to the best score, a rank of 2 to the next best score, etc. The Rho[1] may be computed by the formula:

$$1 - \frac{6\Sigma D^2}{N(N^2-1)}$$

The writer found the mean,[2] standard deviation,[3] and the T score[4] for each of the fitness test items. The T scores for all of the test items were then totaled for each individual to give that individual a total T score. These scores are

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[1]Charles H. McCloy, Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, Inc., 1954), pp. 435-437.

[2]Everett F. Lindquist, A First Course in Statistics (New York: Houghton Mifflin Co., 1938), pp. 52-60.

[3]Ibid., pp. 75-77.

[4]Ibid., pp. 149-50.

tabulated in Table I in the appendix. The mean, standard deviation, and T score were then computed for the gymnastic performance test and the T scores ranked. Tables II and III in the appendix are concerned with the results. The correlation between the fitness test and the gymnastic performance scores was then calculated and proved to be .6872. The difference between Rho and its equivalent "Pearson r" is so small that with little loss of accuracy, Rho may be taken as equal directly to r.[5]

When testing Rho (.6872) against the null hypothesis[6] it was found that the r was .304 at the 5 per cent level of significance or confidence and .393 at the 1 per cent level of significance. From this the writer concluded that since .6872 is larger at both levels of significance, the null hypothesis is rejected and the value of this Rho is significant.

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[5]Henry Garrett, Statistics in Psychology and Education (New York: Longmans, Green and Co., 1948), p. 346.

[6]Ibid., pp. 344-47, 298-302.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The problem. It was the purpose of this study (1) to develop an experimental teaching program in beginning gymnastics for high school boys; (2) to show the relationship between selected fitness test items and the gymnastic abilities demonstrated at the end of the experimental program; and (3) to suggest areas for future research in gymnastics teaching and testing.

Related material. An investigation of the related material revealed that very little has been written in the area of testing and evaluation in the field of gymnastics on the secondary level. The two sources found by the writer in the testing or evaluation area were Wettstone's study of the prediction of potential gymnastic ability and a report by Zwarg on the judging and evaluation of competitive gymnastics. The investigator also found a report by Di Giavanna on the structure of body types of gymnasts. The other materials related to this study were concerned with the teaching of the gymnastic program and techniques of teaching. They included Ryser's A Teacher's Manual for Tumbling and Apparatus Stunts, West's The Gymnast's Manual, and the naval aviation physical training manual, Gymnastics and Tumbling.

Procedure. The writer had no selection privileges for the forty-one sophomore boys who were members of his physical education class. None of the forty-one boys had had any experience in gymnastics. The first six weeks were devoted to a conditioning program which included tests of running, jumping, and strength. At the end of the six-week period, a fitness test was given. This test included the following items: chin-ups, dips, stick balance, leg lifts, and squat thrust. The results were tabulated in a frequency distribution, and the mean, standard deviation, and T score were calculated for each boy on each test item. After the administration of the fitness test, a thirty-period unit of instruction and practice of elementary gymnastics followed. At the culmination of this unit, three competent and experienced judges judged the boys on their gymnastic ability. The scores of the three judges were then tabulated and placed in a frequency distribution. The mean, standard deviation, and total T score were then calculated to find a T score on all-round gymnastic ability. The results of the two tests were then correlated with a Rho rank-difference correlation.

Summary of results. The mean scores and the standard deviation scores earned by the forty-one boys on each of the five fitness test items were as follows:

Item	Mean	Standard Deviation
Balance	38.17 seconds	± 25.4
Dips	7.463	± 4.54
Pull-ups	5.853	± 4.48
Leg lifts	11.122	± 6.35
Squat thrusts	34.073	± 5.001

The mean and standard deviation of the judges' scores on gymnastic ability were as follows:

Mean Score	Standard Deviation
46.25	20.55

Since a score of 70 or 80 is considered high in gymnastic competition, a mean score of 46.25, in the opinion of the writer, is an indication that the class learned a great deal from the teaching program.

In correlating the fitness items with the judges' scores, a rank-difference correlation was used. This correlation produced a Rho of .6872, which disproved the null hypothesis at the 5 and the 1 per cent level of significance.

Conclusions. On the basis of the above findings, the following conclusions are suggested.

1. The fitness test items may be used for the classification of students at the secondary level in elementary gymnastic instruction.

2. The results obtained indicate that the students, on the whole, developed a good degree of gymnastic skill.
3. Based on observations by the writer and other members of the school staff, this program created a great deal of interest in gymnastics and motivated a large number of the students to report for varsity gymnastic practice the following semester. The writer feels that a testing and teaching program at the secondary level in elementary gymnastics adds to the physical education program as well as to the interscholastic program.
4. There is a definite need for further research in the area of gymnastics, especially in the specific area of testing and evaluation.

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APPENDIX

TABLE I

RESULTS OF FITNESS TEST ITEMS AND TOTAL T SCORES FOR BOTH TESTS

PUPIL NO.	BALANCE M 38.17 SD 25.4		DIPS M 7.463 SD 4.54		PULL-UPS M 5.853 SD 4.48		LEG LIFTS M 11.122 SD 6.35		SQUAT THRUST M 34.073 SD 5.001		TOTAL T First test	TOTAL T Second test
	R	T	R	T	R	T	R	T	R	T	Pred.	Perf.
1	84	68.04	6	46.78	0	36.94	20	65.55	29	38.56	255.87	54.74
2	81	66.86	1	35.94	0	36.94	4	38.79	30	41.86	220.39	40.64
3	24	44.43	8	51.18	3	43.64	19	62.40	37	55.85	257.50	42.58
4	11	39.31	7	48.99	10	59.30	12	51.82	25	31.86	231.28	44.04
5	13	40.10	9	53.38	3	43.64	10	48.24	33	47.86	233.22	38.69
6	40	50.72	7	48.99	3	43.64	14	56.10	36	53.85	253.30	45.02
7	16	41.28	1	35.94	7	52.56	5	40.36	30	41.86	212.00	54.25
8	7	37.73	0	33.59	0	36.74	3	37.30	23	27.86	174.91	41.12
9	39	50.32	0	33.59	1	39.17	4	38.79	28	37.86	199.73	33.34
10	102	75.12	13	62.19	10	59.30	11	49.81	38	57.85	304.27	65.45
11	35	49.88	3	40.20	3	43.64	11	49.81	25	31.86	215.39	41.61
12	73	63.71	1	35.94	7	52.56	11	49.81	36	53.85	255.33	47.45
13	12	39.70	8	51.18	11	61.48	12	51.82	28	37.86	242.04	44.99
14	34	48.39	10	55.58	10	59.30	12	51.82	35	51.85	266.94	56.20
15	27	45.61	10	55.58	7	52.56	17	59.25	36	53.85	266.85	46.48
16	60	58.59	8	51.18	7	52.56	18	60.83	34	49.86	273.02	62.53
17	15	40.88	11	57.79	3	43.64	10	48.24	40	61.85	252.40	62.53
18	16	41.28	2	37.97	4	45.87	4	38.79	36	53.85	217.76	48.91
19	25	44.82	3	40.20	8	54.79	6	41.94	39	59.85	241.60	46.48
20	14	40.49	1	35.94	3	43.64	11	49.81	30	41.86	211.74	31.39
21	16	41.28	3	40.20	4	45.87	19	62.40	32	45.86	235.61	48.91

TABLE I (continued)

PUPIL NO.	BALANCE		DIPS		PULL-UPS		LEG LIFTS		SQUAT THRUST		TOTAL T	
	M 38.17 SD 25.4		M 7.463 SD 4.54		M 5.853 SD 4.48		M 11.122 SD 6.35		M 34.073 SD 5.001		First test	Second test
	R	T	R	T	R	T	R	T	R	T	Pred.	Perf.
22	40	50.72	2	37.97	1	39.17	10	48.24	33	47.86	223.96	42.58
23	27	45.61	12	59.99	14	68.18	10	48.24	35	51.85	273.87	54.25
24	63	60.16	5	44.58	7	52.56	25	71.85	33	47.86	277.01	43.07
25	42	51.50	13	62.19	5	48.10	13	54.53	44	59.84	276.16	46.96
26	31	47.18	7	48.99	5	48.10	13	54.53	33	47.86	246.66	46.48
27	67	61.74	7	48.99	11	61.48	10	48.24	42	65.85	286.30	64.96
28	21	43.25	7	48.99	7	52.56	6	41.94	37	55.85	242.59	61.55
29	7	37.73	6	46.78	5	48.10	11	49.81	37	55.85	238.27	53.64
30	40	50.72	3	40.20	1	39.17	6	41.94	35	51.85	223.88	62.53
31	75	64.53	10	55.58	15	70.41	25	71.85	40	61.85	324.22	64.96
32	3	36.00	0	33.59	0	36.94	0	32.49	25	31.86	170.88	33.34
33	54	56.23	14	64.39	10	59.30	20	65.55	42	65.85	311.32	67.42
34	17	41.67	5	44.58	0	36.94	8	45.09	34	49.86	218.14	39.18
35	54	56.23	19	75.41	17	74.88	10	48.24	40	61.85	316.61	68.32
36	9	38.52	9	53.38	6	50.32	11	49.81	32	45.86	237.89	53.28
37	62	59.38	12	59.99	14	68.18	13	54.53	36	53.85	295.93	58.63
38	54	56.23	9	53.38	4	45.87	9	46.35	36	53.85	255.86	50.85
39	63	60.13	11	57.97	9	57.02	25	71.85	34	49.86	296.83	60.58
40	22	44.98	4	42.38	5	48.10	0	32.49	24	29.86	197.81	42.10
41	26	45.40	1	35.94	0	36.94	0	32.49	32	45.86	196.63	47.94

M----------Mean
SD----------Standard Deviation
R----------Raw Score
T----------T Score

$$T = \frac{10(S - M)}{\sigma} + 50$$

TABLE II

RESULTS OF JUDGES' SCORES ON GYMNASTIC ABILITY

Scores	f	cf	x	fx	d	fd
80-84	2	41	82	164	9	18
75-79	3	39	77	231	8	24
70-74	4	36	72	288	7	28
65-69	1	32	67	67	6	6
60-64	1	31	62	62	5	5
55-59	4	30	57	228	4	16
50-54	1	26	52	52	3	3
45-49	2	25	47	94	2	4
40-44	5	23	42	210	1	5
35-39	5	18	37	185	0	+109
30-34	5	13	32	160	1	5
25-29	3	8	27	81	2	6
20-24	2	5	22	44	3	6
15-19	0	3	17	0	4	0
10-14	2	3	12	24	5	10
5-9	1	1	7	7	6	6
						-33

$$M = AM + \left(\frac{\Sigma fd}{n}\right) i$$

$$M = 46.25$$

$$Mdn = l + \left(\frac{\frac{n}{2} - F}{fm}\right) i$$

$$Mdn = 42.0$$

$$\sigma = \sqrt{\frac{\Sigma fd^2}{n} - \left(\frac{\Sigma fd}{n}\right)^2}\, i$$

$$\sigma = 20.55$$

TABLE III

RHO RANK-DIFFERENCE CORRELATION

PUPIL NO.	Fitness Group		Performance Group		Difference Between	
	T Scores	Rank	T Scores	Rank	Ranks	Difference^2
1	255.87	15	54.74	13	2	4
2	220.39	31	40.64	36	5	25
3	257.50	14	42.58	31.5	17.5	306.25
4	231.28	28	44.04	29	1	1
5	233.22	27	38.69	38	11	121
6	253.30	18	45.02	27	9	81
7	212.00	35	54.25	14.5	20.5	420.25
8	174.91	40	41.12	35	5	25
9	199.73	37	33.34	39.5	2.5	6.25
10	304.27	4	65.45	3	1	1
11	215.39	34	41.61	34	0	0
12	255.33	17	47.45	22	5	25
13	242.04	22	44.99	28	6	36
14	266.94	12	56.20	12	0	0
15	266.85	13	46.48	25	12	144
16	273.02	11	62.53	7	4	16
17	252.40	19	62.53	7	12	144
18	217.76	33	48.91	19.5	13.5	182.25
19	241.60	23	46.48	25	2	4
20	211.74	36	31.39	41	5	25
21	235.61	26	48.91	19.5	6.5	42.25
22	223.96	29	42.58	31.5	2.5	6.25
23	273.87	10	54.25	14.5	4.5	20.25
24	277.01	8	43.07	30	22	484
25	276.16	9	46.96	23	14	196
26	246.66	20	46.48	25	5	25
27	286.30	7	64.96	4.5	2.5	6.25
28	242.59	21	61.55	9	12	144
29	238.27	24	53.64	16	8	64
30	223.88	30	62.53	7	23	529
31	324.22	1	64.96	4.5	3.5	12.25
32	170.88	41	33.34	39.5	1.5	2.25
33	311.32	3	67.42	2	1	1
34	218.14	32	39.18	37	5	25
35	316.61	2	68.32	1	1	1
36	237.89	25	53.28	17	8	64
37	295.93	6	58.63	11	5	25
38	255.68	16	50.85	18	2	4
39	296.83	5	60.58	10	5	25
40	197.81	38	42.10	33	5	25
41	196.63	39	47.94	21	18	324
					D^2 =	3592.50

TABLE III (continued)

$$\text{Rho} = \frac{1 - 6\Sigma D^2}{N(N^2-1)}$$

$$\text{Rho} = 1 - .3128$$

$$\text{Rho} = .6872$$