PHYSICAL ABILITY TESTING OF MALE STUDENTS IN GRADES FOUR THROUGH TWELVE

Thesis for the Degree of M. A.

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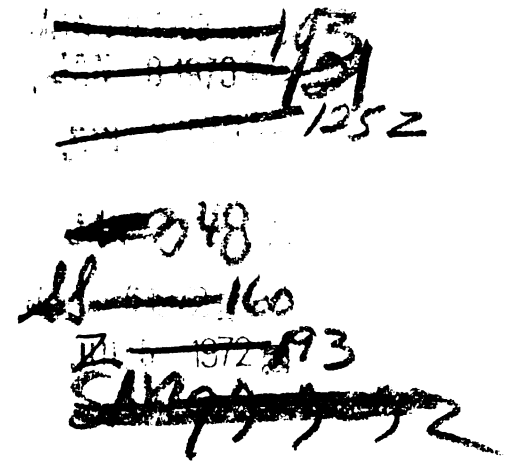

ABSTRACT

PHYSICAL ABILITY TESTING OF MALE
STUDENTS IN GRADES FOUR
THROUGH TWELVE

by David L. Bos

Statement of the Problem:

Research indicates a lack of data on the physical ability levels in the intermediate grades. This study was an attempt to establish a set of norms for use in the Unity Christian School System.

Why the Problem was Selected:

This study is intended to be an aid or guide to the physical education department of Hudsonville Unity Christian School System in determining some of the goals or objectives for the total physical education program.

This study will also make available more physical ability tests scored according to the percentile rank.

Methodology:

The information was obtained by giving each boy in the Unity Christian School System, in grades four through twelve, a battery of physical ability tests. The testing involved five schools. The data were key-punched in IBM cards and these cards were processed to set up percentile tables.

Percentile tables were developed by ages and grade levels for male students in grades four through twelve. Tables were developed for selected measures of strength, power, cardiovascular, muscular endurance, agility, flexibility, and body composition.

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By

David L. Bos

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CHAPTER I

INTRODUCTION

There is a need for increasing the continuity or progression in the physical education in program in the Unity Christian School System. The major factors are the lack of time for complete evaluation and those that are geographical in nature. The physical education staff desires to improve articulation between the grades and junior and senior high schools. This study of physical ability testing was undertaken principally for this reason.

I. THE PROBLEM

Statement of the problem. It was the purpose of the study to set up physical ability norms for all male students in the Unity Christian School System.

Students participate in physical education classes at the high school each day of the week. This provides enough time for a rather complete measurement of physical ability levels for diagnosis and guidance of the students.

However, in grades four through nine, physical education classes are offered only once a week. This is inadequate and instructors do not have enough time for complete evaluation of the physical ability levels.

Attempts have been made to locate data on physical ability levels, but there is not very much available in percentile ranking, particularly in the intermediate grade level.

Importance of the study. Physical education can make a unique contribution to the total development of the child. Education, as well as physical education, involves activity and development. Physical education is concerned with the development of the organic systems, with the development of the neuro-muscular system, and the skills which are acquired as the result of such development.

The educational scheme of Unity Christian High School is set upon these foundations. Thus, the physical educators should know to what extent this development is taking place, and to what extent the child is progressing from month to month and from year to year.

In order to measure this development, the physical education department of Unity Christian High School administers physical fitness tests three times each school year. The first tests are given at the start of the school term in order to classify the individual students. These tests indicate in which areas of physical ability each student excells or is weak. These tests serve as a means of classification, but also as a means of diagnosis and guidance.

The second battery of tests (the three batteries of tests are identical) is given at the end of the first

semester of school. The scores of the second tests serve as a means of appraisal of pupil progress, pupil iniative, and teacher efficiency.

The third series of tests are taken at the end of the school year, which is at the end of the second semester. These scores are used to evaluate pupil progress over the entire year. The test results reflect the efficiency of the instructor, his methods, and the curricular offering.

However, up to now, very little testing has been done in the junior high or intermediate grades. Physical education classes are offered only one class period per week and this is inadequate for complete testing.

The junior high and elementary schools in the school system are completely separate from the high school. They are controlled by different administration and separate school boards. The high school administration and board recognizes the importance of physical education and it is properly placed in the curriculum.

This markedly hampers articulation between the schools in setting up a physical education program. It has also hampered this study to a degree. It is hoped that this study will help coordinate the program and that the school boards and administrations of the junior highs and elementary schools will be favorably influenced to stress physical education more in the future.

It is also hoped that the study will provide more concrete data as to what a child can be expected to do

physically at the various age levels, and by doing this, that physical education in general will benefit from this study.

II. DEFINITIONS OF TERMS USED

Measurement. Determination of the ability of the student in various aspects of physical ability.

Evaluation. Determination of how the objectives are reached.

Physical ability tests (fitness tests and test battery) Technique of measurement and evaluation used to gain information about the individual. Copies of the test given at Unity Christian High and of the test used in this study can be located in the appendix.

Classification. Arrangement of individuals into homogeneous groups.

Characteristic. Distinguishing feature of the individual.

Diagnosis. Analysis of the primary components underlying characteristics.

Rating. A judgment estimate of the testee with respect to the characteristic or ability under consideration.

Achievement. Accomplishment of the individual beyond a definite starting point.[1]

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[1]L. Larson and R. D. Yocum, Measurement and Evaluation in Physical Education, Health, and Recreation (St. Louis: C. V. Mosby Company, 1954), pp. 20-21.

III. LIMITATIONS

The tests were given to all males in grades four through twelve. The twelfth grade does not have required physical education so it was impossible to test all the seniors. Therefore, the senior results are not too conclusive. In grades four through eleven, the test battery was given to all the boys with but a few exceptions. Those with heart conditions or asthma did not take the endurance tests, and a few boys with broken bones, etc., could not take part.

A few of the tests had to be given outdoors. The weather conditions varied during the course of the testing and this may have been a factor in the results.

CHAPTER II

REVIEW OF THE LITERATURE

This review is limited to physical ability testing results that have been made up into percentiles. Percentile tables are more practical because they can be readily understood by parents and students.

One of the latest studies was completed by Fleishman. More than 20,000 boys and girls in 45 cities throughout the country were tested.[2] The age range was 14 through 18, although norms were developed down through age 12 for some tests. He attempted to measure the following factor areas: strength, flexibility--speed, balance, coordination, and endurance. The norms for the vaious tests, in percentile form from Fleishman's Examiner's Manual.[3]

The American Association for Health, Physical Education, and Recreation also has constructed percentile tables for the National Fitness Test Program. These norms are available for both boys and girls from the ages ten through eighteen. The tests themselves, however, are not complete as they do not test all the factors involved in physical fitness or ability.

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[2]E. A. Fleishman, The Structure and Measurement of Physical Fitness (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964), p. 3.

[3]E. A. Fleishman, Examiner's Manual for the Basic Fitness Tests (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964).

Johnson measured selected fundamental skills in children in grades 1-6. The skills tested were throwing, catching, kicking, batting, jumping, and running.[4] Percentile tables were prepared for these tests. These are not tests of physical ability, but rather skill tests. However, some of these might be used for basic fitness tests.

These are about the extent of the norms that are readily available for the average physical education teacher. Many schools, however, have compiled their own norms for their fitness tests.

There is a wealth of material on testing and measurement. Many studies have been done on certain areas of physical ability testing, such as strength. Some of these studies have analyzed data to determine the means and standard deviation, but very few percentile tables have been calculated.

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[4] R. D. Johnson, "Measurement of Achievement in Fundamental Skills of Elementary School Children," Research Quarterly, 33:94, 1962.

CHAPTER III

METHODOLOGY

The test battery which follows was given to the male students in Unity Christian High School located in Hudsonville, Michigan; to junior high and elementary male students in the Hudsonville Christian Schools; and to junior high and elementary male students of the Jenison Christian Schools located in the neighboring community of Jenison, Michigan. This involved two schools in Hudsonville: Unity Christian High and Hudsonville Christian, and three schools in Jenison: Jenison Christian Junior High and two Jenison Christian Elementary Schools.

Each student took the same tests. The tests were administered by the writer, who is the Physical Education Director of Unity Christian High, and six responsible senior boys who received special training in the testing techniques. Lloyd Tinholt, physical education instructor in the Jenison Christian Junior High, assisted with the testing in Jenison Christian Junior High. The testing took place from October, 1965 until the end of April, 1966.

Each student was given a printed test card and his scores were recorded by the testors on these cards. The students had possession of these cards only during the time of the actual testing. Raw scores were recorded on the righthand side of the test card. The final score was placed in columns provided on the lefthand side of the card to

facilitate key-punching cards for later use in a card sorting machine. A sample of the test card design can be found in the appendix.

A number was assigned to each student to simplify key-punching the data cards.

The date of birth was recorded by month and year. Thus, January, 1949 became 0149, and December, 1954 became 1254.

The test battery was as follows:

1. Strength test--hand grip test
2. Agility test
3. Power tests
    a. Standing broad jump
    b. Softball throw
4. Flexibility test--hip-trunk flexion test
5. Cardio-pulmonary test--three minute step test
6. Anthropometric measurements
    a. Height
    b. Weight
    c. Skinfold (fat) measurements
        (1) Posterior upper arm
        (2) Subscapular
        (3) Hip
        (4) Abdomen
        (5) Front thigh
7. Muscular endurance
    a. 600 yard run-walk

b. Pull ups (overhand grip)

c. Push ups

711 boys were tested in grades four through twelve. The following lists show the number of cases in each age and grade level:

GRADE	CASES	AGE	CASES
12	39	18	42
11	77	17	77
10	77	16	79
9	69	15	74
8	86	14	85
7	89	13	91
6	90	12	90
5	97	11	93
4	87	10	76

The strength tests were given on a Narragansett Hand Dynamometer. The test was administered as described by Fleishman.[5]

The agility test began with the student lying flat on his stomach with his hands outstretched. The raw scores were recorded to the tenth of a second. Each student received two trials and the average score was recorded. A diagram of this test may be found in the appendix.

Two tests were administered to measure power. The standing broad jump was measured in centimeters to facilitate key-punching the data cards.

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[5]E. A. Fleishman. Examiner's Manual for the Basic Fitness Tests (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964), p. 38.

The second power tests was the softball throw. It was administered as described by Fleishman.[6]

The flexibility test was a hip-trunk flexion test given from a seated position. The zero reading was ten centimeters. This was done to eleminate negative numbers.

The cardio-pulmonary test was a three minute step test. The rate was thirty times per minute. A pulse rate was taken and recorded from one minute to one and one half minutes after the exercise.

Height was measured twice in stocking feet. The average height was recorded in centimeters.

One weight measurement was taken and recorded in pounds. The boys were clad in shorts and socks and everyone was weighed on the same scale.

Fat measurement were taken using a Lange skin-fold caliper.* Two measurements were taken on each position and the average was recorded in millimeters. The five areas measured were:

1. Back of the upper arm
2. Subscapular
3. Hip, just above the crest of the ileum
4. Abdominal, approximately two inches to the side of the naval.
5. Front thigh.

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[6] Ibid., p. 37.

*Constructed by Wenner-Gren Aeronautical Laboratory, University of Kentucky, Lexington, Kentucky.

The averages of these readings were added up to obtain a total fat measurement for each student.

Muscular endurance was measured by three tests. The tests used were the 600 yard run-walk, pull ups using the overhand grip, and push ups.

The test battery was selected to measure the following areas:

1. Strength
2. Agility
3. Power
4. Flexibility
5. Cardio-pulmonary endurance
6. Muscular endurance
7. Anthropometric measurements to determine how body build affected performance.

CHAPTER IV

SUMMARY

It is impossible to analyze the data received from this testing program without other test results. Future testing will be done in the Hudsonville Unity Christian School System to be used for the diagnosis and guidance of the students and the program.

This study is the starting point for the Hudsonville Unity Christian School System in its overall evaluation of physical education. The tables found in the appendix are the total results of the study. The sample consisted of all available students in the school system.

In evaluating the testing procedure, most of the tests were easily administered. The clerical work involved in recording and averaging scores and also running the keypunched cards through the card sorter was very time consuming. The most difficult test to administer was the push up test for muscular endurance. It was too easy for the students to "cheat" on this test. Each one had to be watched very closely to see that he followed instructions perfectly. The other tests were easily administered.

The current data can be used as pilot information for use in developing more comprehensive standards. The current information will also serve as the initial data in developing more reliable tables.

These tables, however, can be used for future classes in developing profile information. Although the samples were not large, the fact that they included all available subjects adds to the value of the standards for further use in the Hudsonville School System. The tables will also be of some value for use in other school systems until further standards can be developed.

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APPENDIX

TABLE I

STRENGTH

Per-centile	Age Levels								
	10	11	12	13	14	15	16	17	18
100	60.0	78.0	71.0	80.0	105.5	128.5	141.0	183.0	144.5
90	51.0	59.0	65.0	73.0	80.5	97.5	124.0	134.0	139.0
80	49.0	53.0	60.0	69.0	75.0	90.5	113.0	124.0	134.0
70	46.0	50.5	56.5	63.5	70.0	87.0	107.0	119.5	127.0
60	44.0	50.0	54.0	59.0	68.0	82.0	102.0	114.0	123.0
50	43.0	47.5	53.0	57.5	65.0	76.0	95.0	110.0	117.0
40	40.0	44.0	50.0	56.0	64.0	75.0	91.0	105.0	115.0
30	38.5	42.0	47.5	53.0	60.0	70.0	87.0	100.0	109.5
20	36.0	40.5	46.5	49.0	56.0	65.0	79.0	94.0	107.5
10	32.0	37.5	40.5	45.0	45.0	58.0	68.0	88.0	96.0
0	23.5	23.0	22.5	37.5	37.5	44.5	41.0	71.0	85.0

TABLE II

STRENGTH

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	65.5	78.0	74.0	87.0	105.5	128.5	150.0	183.0	158.0
90	51.0	59.5	66.0	74.0	84.0	99.0	126.0	131.0	139.0
80	50.0	54.0	60.5	69.0	79.5	94.0	120.0	125.5	135.0
70	48.0	52.0	57.0	63.0	73.5	89.0	112.0	120.0	124.0
60	44.0	49.0	55.5	59.5	70.0	82.0	104.0	115.5	117.0
50	43.0	47.5	53.0	58.0	68.0	77.0	97.0	110.5	116.5
40	41.0	46.0	50.0	55.0	65.0	75.5	93.0	106.5	115.0
30	40.0	43.0	48.0	53.0	64.0	71.0	89.0	100.5	109.0
20	36.5	40.5	45.0	49.0	59.0	66.0	84.0	92.0	105.0
10	34.0	37.5	40.0	44.5	50.0	57.5	68.0	88.0	92.0
0	23.5	23.0	22.5	37.5	37.5	44.5	41.0	71.0	85.0

TABLE III

AGILITY

Per-centile	Age								
	10	11	12	13	14	15	16	17	18
100	10.50	9.70	9.80	9.65	9.45	9.20	8.40	8.20	8.45
90	11.15	11.20	10.25	10.20	10.10	9.75	8.80	8.75	8.70
80	11.45	11.45	10.75	10.50	10.25	10.05	9.10	8.85	8.75
70	11.75	11.80	11.10	10.85	10.50	10.20	9.30	9.00	8.90
60	12.40	12.15	11.25	10.95	10.60	10.35	9.45	9.15	9.00
50	13.30	12.60	11.45	11.20	10.75	10.45	9.70	9.25	9.10
40	14.00	13.15	11.85	11.30	10.95	10.60	10.00	9.45	9.15
30	14.80	13.75	12.10	11.45	11.15	10.70	10.10	9.55	9.30
20	15.30	14.40	12.55	11.85	11.50	10.95	10.30	9.75	9.50
10	15.90	14.95	14.00	12.45	11.65	11.35	10.65	10.20	9.55
0	21.35	16.75	16.95	14.00	12.00	12.25	11.75	11.25	10.35

TABLE IV

AGILITY

Percentile	Grade Level								
	4	5	6	7	8	9	10	11	12
100	9.70	9.80	9.45	10.00	9.65	9.20	8.40	8.20	8.35
90	11.10	11.05	10.15	10.15	10.05	9.65	8.80	8.70	8.45
80	11.55	11.45	10.60	10.50	10.25	9.90	9.05	8.85	8.75
70	12.05	11.60	10.90	10.80	10.35	10.05	9.25	9.00	8.90
60	12.50	12.05	11.15	11.05	10.55	10.25	9.35	9.10	8.90
50	13.30	12.30	11.30	11.25	10.65	10.35	9.55	9.20	9.05
40	13.85	12.95	11.50	11.40	10.80	10.50	9.70	9.30	9.15
30	14.80	13.45	11.90	11.50	10.95	10.65	10.05	9.50	9.30
20	15.30	14.10	12.35	11.90	11.15	10.95	10.25	9.75	9.50
10	16.15	14.55	12.95	12.55	11.55	11.30	10.55	10.05	9.55
0	21.35	16.75	16.40	14.00	13.80	13.15	11.55	10.95	11.20

TABLE V

STANDING BROAD JUMP

Per-centile	Age								
	10	11	12	13	14	15	16	17	18
100	151.5	182.5	180.0	194.0	212.5	229.0	246.5	266.5	254.0
90	137.5	145.5	163.0	175.5	189.0	208.5	226.5	231.0	237.0
80	127.0	136.0	156.5	167.5	180.0	190.5	217.0	227.0	223.0
70	122.0	132.5	153.0	160.5	174.0	180.5	207.0	218.5	221.0
60	118.5	129.0	149.0	153.0	167.5	170.5	202.5	213.0	217.5
50	114.0	124.0	144.0	150.5	160.5	166.5	195.0	208.5	215.0
40	106.5	118.5	138.0	148.0	156.0	162.0	189.5	204.5	205.0
30	103.5	112.0	131.5	144.5	150.5	156.0	182.0	198.0	200.5
20	94.5	104.0	121.0	138.5	144.0	148.0	175.0	188.5	196.0
10	87.5	95.0	108.5	132.0	137.5	131.0	158.5	173.0	182.0
0	77.5	79.0	72.5	115.0	113.0	106.5	126.5	157.0	160.0

TABLE VI

STANDING BROAD JUMP

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	153.0	182.5	181.0	194.0	229.0	228.5	246.5	266.5	254.0
90	137.5	146.5	163.0	175.5	192.0	203.0	226.5	231.5	237.0
80	127.5	136.0	158.0	164.5	180.5	189.5	218.0	227.0	224.5
70	122.0	133.5	154.5	155.0	178.0	181.5	211.5	218.5	222.0
60	119.0	129.0	151.0	151.5	170.5	169.5	203.5	213.5	217.5
50	114.5	124.0	146.0	149.0	166.0	162.5	200.0	207.0	211.5
40	107.5	116.0	140.5	145.0	161.5	159.5	192.5	205.0	203.5
30	104.0	108.5	135.0	143.0	156.0	156.0	188.0	197.5	199.5
20	95.0	103.5	125.5	137.0	148.5	149.0	179.5	190.0	194.0
10	87.5	93.0	120.5	131.5	141.0	131.5	173.5	173.0	172.0
0	72.5	79.0	89.0	115.0	106.5	107.5	126.5	157.0	160.0

TABLE VII

SOFTBALL THROW

Percentile	Age								
	10	11	12	13	14	15	16	17	18
100	104.5	134.5	136.0	164.5	183.5	217.0	215.0	238.5	237.0
90	89.0	108.0	120.5	140.0	153.0	169.0	193.0	200.0	225.0
80	78.0	96.5	111.0	126.0	140.5	160.0	179.5	183.0	216.0
70	75.0	92.0	104.5	121.5	135.5	149.0	175.0	175.5	210.5
60	72.5	88.5	100.5	115.5	127.5	144.5	165.5	169.0	197.0
50	67.0	81.5	98.5	111.5	124.0	139.5	161.0	164.5	195.0
40	63.0	78.0	92.0	105.5	120.0	133.0	151.5	155.5	192.0
30	57.5	74.0	87.0	102.5	112.5	128.5	145.0	146.0	187.5
20	55.0	67.0	80.0	98.0	105.5	125.5	137.0	138.0	177.5
10	49.0	57.5	70.0	88.5	95.0	112.0	121.0	129.5	152.5
0	32.0	30.5	32.5	77.0	68.0	95.5	81.0	90.0	116.0

TABLE VIII

SOFTBALL THROW

Per-centile	Grade Level								
	4	5	6	7	8	9	10	11	12
100	111.5	134.5	157.5	183.5	180.0	217.0	215.0	238.5	237.0
90	81.5	108.0	121.5	143.5	153.0	175.0	195.0	207.5	226.0
80	76.5	97.5	113.0	131.5	143.0	161.0	179.0	192.5	216.5
70	74.0	92.5	106.0	123.0	135.5	151.5	175.0	180.5	212.0
60	69.5	90.5	101.5	116.0	130.0	144.5	165.5	171.5	197.5
50	65.5	86.5	99.5	113.5	125.0	140.0	161.0	166.0	196.0
40	60.5	81.5	95.5	108.0	120.5	135.5	152.0	155.5	192.0
30	57.5	78.0	88.5	103.0	115.0	128.5	145.5	149.0	187.0
20	55.0	73.0	83.0	100.0	106.0	125.5	133.0	141.5	177.5
10	47.0	63.0	75.0	93.5	101.5	111.5	121.0	134.5	152.5
0	32.0	30.5	58.5	76.5	68.0	95.5	81.0	90.0	140.0

TABLE IX

FLEXIBILITY

Percentile	Age								
	10	11	12	13	14	15	16	17	18
100	25.0	25.5	26.0	27.5	28.0	29.5	31.0	32.0	41.5
90	17.5	17.5	19.5	19.0	20.5	24.0	27.0	28.5	29.5
80	15.5	15.0	16.0	16.5	19.5	20.5	22.5	26.5	27.5
70	13.0	14.0	14.0	15.5	17.5	19.0	20.5	24.0	24.0
60	12.5	12.0	13.0	14.5	15.5	17.5	19.0	23.0	22.0
50	12.0	10.5	12.0	13.0	13.5	15.0	16.5	21.0	21.5
40	11.0	10.0	11.0	12.5	12.5	14.0	15.5	19.0	20.0
30	9.5	8.5	9.5	11.0	11.0	12.5	14.0	17.0	19.0
20	6.5	6.0	7.5	9.5	9.5	9.5	12.5	14.5	14.5
10	4.5	4.5	4.0	4.5	6.0	5.0	10.5	10.0	11.0
0	1.0	1.0	1.0	1.5	1.0	0.5	2.0	2.0	4.5

TABLE X

FLEXIBILITY

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	25.0	25.5	26.0	27.5	28.0	29.0	31.0	35.0	41.5
90	18.0	17.0	19.5	19.5	21.0	22.5	28.0	28.5	29.5
80	15.5	15.0	15.5	17.5	19.0	20.5	24.0	25.5	27.5
70	13.5	13.5	14.0	15.5	17.5	18.8	22.0	24.0	23.0
60	12.5	12.0	12.5	15.0	15.0	17.5	20.0	22.5	21.5
50	11.5	10.5	12.0	13.5	13.5	15.0	18.5	21.0	20.5
40	10.5	10.0	11.0	13.0	12.5	14.5	16.0	19.5	19.0
30	9.5	8.5	9.0	12.0	12.0	12.5	15.0	17.5	14.5
20	7.0	6.0	6.5	10.0	10.0	9.5	12.5	14.5	12.0
10	5.0	3.0	4.0	6.5	3.5	6.5	10.5	10.0	7.5
0	1.0	10.	1.5	1.5	0.5	3.5	2.0	2.0	4.5

TABLE XI

CARDIO-PULMONARY
(Step Test)

Per-centile	Age								
	10	11	12	13	14	15	16	17	18
100	39	24	29	30	30	20	22	34	35
90	45	45	46	43	46	43	41	44	43
80	51	50	52	48	51	47	49	49	49
70	54	55	57	53	53	50	52	52	51
60	57	57	59	56	55	54	55	55	55
50	59	60	60	59	57	59	58	58	56
40	61	62	62	61	60	62	60	60	60
30	63	63	65	65	63	65	61	64	61
20	65	67	68	67	67	70	64	67	65
10	69	69	70	70	70	75	69	73	69
0	72	75	83	76	90	90	73	80	77

TABLE XII

CARDIO-PULMONARY
(Step Test)

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	39	24	29	30	33	20	23	34	35
90	47	44	46	41	48	42	42	44	37
80	52	46	52	47	52	45	50	49	43
70	55	53	56	52	54	47	53	52	49
60	57	56	59	55	58	51	56	55	50
50	60	58	60	57	60	54	58	58	55
40	62	61	63	60	63	60	60	60	56
30	63	62	65	62	65	62	63	61	60
20	66	66	68	65	69	65	65	65	62
10	69	69	70	69	71	70	69	70	67
0	72	75	83	90	80	90	76	80	77

TABLE XIII

HEIGHT

Per-centile	Age								
	10	11	12	13	14	15	16	17	18
100	157.0	169.0	163.0	174.5	188.0	195.0	191.0	192.0	193.5
90	148.0	155.0	157.0	164.0	170.5	177.0	186.0	187.5	187.5
80	144.0	151.0	155.0	161.0	169.0	174.5	181.0	185.0	184.5
70	143.0	149.5	153.0	157.0	166.0	173.5	179.0	183.0	183.0
60	142.0	148.5	150.0	154.0	162.5	170.0	177.0	181.0	181.0
50	141.0	146.0	148.0	152.0	161.0	167.5	176.0	180.0	180.0
40	139.0	144.0	146.5	151.0	158.5	165.5	173.5	177.0	178.5
30	137.0	142.0	144.5	150.0	154.0	163.5	171.5	174.0	177.5
20	135.0	140.0	143.0	147.0	151.5	160.0	168.5	172.5	176.0
10	131.0	138.0	139.0	145.5	148.0	155.5	163.5	169.5	175.0
0	127.0	130.0	135.0	137.0	144.0	147.0	149.0	153.0	172.5

TABLE XIV

HEIGHT

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	156.0	169.0	163.0	174.5	188.0	195.0	191.0	192.0	193.5
90	147.0	156.0	159.0	164.5	172.0	178.5	186.0	188.0	186.5
80	144.0	152.0	156.0	161.0	170.0	175.3	182.5	185.0	183.0
70	142.0	150.0	153.5	158.0	167.0	174.0	179.5	183.0	182.0
60	142.0	149.0	152.0	154.0	165.0	170.5	177.0	181.0	181.0
50	140.0	148.0	150.0	152.0	167.5	168.5	176.0	180.0	179.5
40	138.0	145.0	147.0	150.0	161.0	166.0	174.0	178.5	178.0
30	137.0	143.5	145.0	148.0	157.5	163.5	171.5	176.0	176.5
20	135.0	141.5	143.0	147.0	154.0	162.0	169.5	173.0	175.0
10	134.0	138.0	139.0	144.0	151.0	157.5	164.5	170.0	174.0
0	127.0	130.0	135.0	137.0	146.0	147.0	149.0	153.0	170.5

TABLE XV

WEIGHT

Per-centile	Age								
	10	11	12	13	14	15	16	17	18
100	139	126	135	170	183	199	210	218	200
90	95	111	106	119	135	159	167	176	192
80	84	99	100	108	121	142	154	168	173
70	79	94	97	102	120	134	146	159	167
60	77	89	95	95	113	125	142	155	159
50	74	84	91	91	108	122	139	150	153
40	71	82	85	86	101	120	135	145	147
30	69	78	80	84	96	115	131	138	144
20	66	74	75	80	91	106	126	135	140
10	65	69	70	78	86	100	116	126	133
0	54	55	62	70	70	78	92	104	129

TABLE XVI

WEIGHT

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	139	130	135	170	183	199	210	218	200
90	93	114	109	120	138	159	168	178	195
80	84	99	100	110	128	141	159	169	182
70	79	95	97	105	122	134	152	161	162
60	77	90	94	99	119	128	145	155	160
50	75	84	91	92	111	121	143	151	155
40	72	82	87	86	107	120	139	145	151
30	70	78	81	84	100	115	135	138	146
20	67	73	75	80	96	106	130	135	141
10	65	68	71	78	87	100	117	126	133
0	54	55	62	70	70	78	92	104	129

TABLE XVII

SKINFOLD (FAT) MEASUREMENT OF ARM

Per-centile	Age								
	10	11	12	13	14	15	16	17	18
100	40.0	32.5	35.0	35.0	33.5	31.0	26.0	35.5	23.5
90	19.0	22.0	20.5	18.5	19.5	20.0	17.0	17.0	19.0
80	16.0	18.5	18.5	15.5	16.0	17.0	13.5	14.0	15.0
70	13.5	16.0	15.5	14.0	13.0	15.5	11.5	12.5	12.5
60	12.5	15.0	13.5	12.5	12.0	13.5	9.0	10.5	11.0
50	11.5	13.5	12.0	11.0	10.5	13.0	8.5	9.5	9.0
40	10.5	11.5	10.5	9.5	10.0	11.5	7.0	8.0	8.5
30	9.5	10.0	10.0	9.0	9.5	10.5	7.0	7.0	8.0
20	8.5	9.0	9.0	8.5	8.0	9.0	6.0	6.0	7.5
10	7.5	8.0	7.5	7.0	7.0	7.0	6.0	5.0	6.5
0	5.0	5.5	6.0	4.5	5.0	5.5	4.0	4.0	5.5

TABLE XVIII

ARM SKINFOLD (FAT) MEASUREMENT

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	40.0	35.0	29.0	38.0	33.5	31.0	35.5	24.0	23.5
90	20.0	22.0	19.5	19.5	19.5	20.0	18.5	16.5	19.0
80	15.5	18.5	17.0	16.5	16.0	17.0	14.5	14.0	17.0
70	14.0	16.0	14.0	15.0	13.0	14.0	12.0	12.0	13.5
60	13.0	14.5	13.0	13.0	12.5	13.0	9.0	10.5	11.5
50	11.5	13.5	11.0	11.0	10.5	11.5	9.0	9.0	10.0
40	10.5	11.5	10.0	10.0	10.0	11.0	7.5	8.0	8.5
30	10.0	11.0	9.0	9.0	9.5	9.0	7.0	7.0	8.0
20	8.5	9.0	8.5	8.5	8.0	7.5	6.0	6.0	7.5
10	7.5	8.0	7.0	7.0	7.0	6.5	6.0	5.0	7.0
0	5.0	5.5	5.0	4.5	5.0	5.5	4.0	4.0	6.0

TABLE XIX

SUBSCAPULAR SKINFOLD (FAT) MEASUREMENT

Per-centile	Age								
	10	11	12	13	14	15	16	17	18
100	29.5	28.5	35.5	25.0	29.5	34.0	38.0	28.5	28.5
90	11.0	14.0	12.5	11.0	11.5	13.0	12.0	14.0	14.0
80	9.0	10.5	10.0	8.5	9.5	10.5	10.0	12.0	11.5
70	8.0	9.5	8.0	7.5	8.0	9.0	8.5	10.0	10.0
60	7.0	8.5	7.5	6.5	7.0	8.5	8.0	9.0	10.0
50	6.5	7.5	7.0	6.0	7.0	8.0	8.0	9.0	9.5
40	6.0	7.0	6.5	6.0	6.5	7.5	7.0	8.0	9.0
30	6.0	6.5	6.0	5.5	6.5	7.0	7.0	8.0	8.5
20	5.5	6.0	5.0	5.5	6.0	6.5	7.0	7.0	8.0
10	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.5	7.0
0	4.0	5.0	4.0	4.0	4.0	5.0	5.0	6.0	6.5

TABLE XX

SUBSCAPULAR SKINFOLD (FAT) MEASUREMENT

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	29.5	35.5	23.5	43.5	29.5	34.0	38.0	28.5	28.5
90	12.0	12.5	11.0	11.5	11.5	13.5	12.0	12.5	17.5
80	9.0	10.0	9.0	8.5	10.0	10.0	10.0	10.5	14.0
70	8.0	9.5	7.5	7.5	8.0	9.0	9.0	9.0	12.0
60	7.5	8.0	7.0	7.0	7.5	8.0	8.0	9.0	10.5
50	7.0	7.5	6.5	6.0	7.0	7.5	8.0	8.5	10.0
40	6.0	7.0	6.0	6.0	7.0	7.0	8.0	8.0	10.0
30	6.0	6.0	6.0	6.0	6.5	6.5	7.0	8.0	9.5
20	5.5	6.0	5.0	5.0	6.0	6.0	7.0	7.0	8.5
10	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.5	8.0
0	4.0	4.0	4.0	4.0	4.0	5.0	5.0	6.0	6.5

TABLE XXI

HIP SKINFOLD (FAT) MEASUREMENT

Per-centile	Age								
	10	11	12	13	14	15	16	17	18
100	44.0	41.0	43.5	41.5	39.0	42.0	49.5	44.5	42.0
90	22.0	29.5	28.0	23.0	24.0	28.0	27.5	28.5	30.0
80	15.5	25.5	22.5	15.5	16.0	22.0	19.0	22.0	24.0
70	14.0	20.5	18.5	12.0	13.0	17.0	16.0	19.0	16.0
60	11.5	16.5	13.0	9.5	11.5	15.0	12.5	16.5	14.0
50	10.5	13.5	11.0	8.5	10.0	13.0	11.0	13.5	13.0
40	8.0	11.0	9.0	8.0	8.5	11.5	10.0	10.0	11.0
30	7.0	9.5	8.0	7.0	7.5	10.0	9.0	9.0	9.0
20	6.0	7.5	6.5	6.5	6.5	7.5	7.5	7.5	9.0
10	5.0	6.5	5.5	5.0	6.0	6.0	6.5	6.5	7.5
0	4.0	4.0	4.0	3.0	3.0	4.0	5.0	5.0	6.0

TABLE XXII

HIP SKINFOLD (FAT) MEASUREMENT

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	44.0	43.0	43.5	45.0	39.0	42.0	49.5	42.5	42.0
90	25.5	29.5	25.0	24.0	23.5	25.0	28.5	27.5	30.0
80	16.0	24.5	21.5	18.5	16.0	19.0	20.0	19.0	26.0
70	14.5	20.5	15.5	12.5	14.0	15.5	19.0	16.5	19.0
60	13.0	16.5	11.5	10.0	12.0	12.0	16.0	14.0	14.5
50	10.5	13.5	9.5	9.0	10.5	11.0	13.0	11.0	13.5
40	8.5	11.5	8.5	8.0	9.0	9.5	10.5	9.5	12.5
30	7.5	9.5	8.0	7.0	8.0	7.5	10.0	8.5	11.0
20	6.5	8.0	6.5	6.5	7.0	6.5	8.0	7.5	9.0
10	5.0	6.5	5.0	5.5	6.0	6.0	6.5	6.0	8.0
0	4.0	4.0	4.0	3.0	3.0	4.0	5.0	5.0	6.0

TABLE XXIII

ABDOMINAL SKINFOLD (FAT) MEASUREMENT

Per-centile	Age Levels								
	10	11	12	13	14	15	16	17	18
100	45.5	45.5	45.5	39.0	48.5	44.5	54.5	47.5	46.5
90	20.5	30.5	27.5	24.0	21.5	26.5	25.5	26.0	27.0
80	16.5	25.5	22.0	16.0	18.0	23.0	17.0	21.5	25.0
70	13.5	20.5	18.0	12.0	14.5	17.5	15.0	17.0	15.0
60	10.5	16.0	11.5	9.5	11.0	14.0	13.5	14.5	14.0
50	9.5	13.5	10.5	8.5	10.0	11.0	11.5	13.0	12.0
40	8.0	10.0	8.0	7.0	8.5	10.0	10.0	10.5	11.5
30	6.0	9.0	7.0	6.5	8.0	8.5	8.5	9.0	11.0
20	6.0	7.5	6.0	5.5	7.0	6.5	8.0	8.0	7.5
10	5.0	6.0	5.0	5.0	6.0	5.0	6.5	6.5	6.0
0	4.0	4.5	3.5	4.0	3.0	4.0	5.0	5.0	5.0

TABLE XXIV

ABDOMINAL SKIN FOLD (FAT) MEASUREMENT

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	45.5	45.5	44.0	59.0	44.5	44.0	54.5	47.5	46.5
90	24.0	31.0	24.5	27.5	22.5	25.0	31.0	24.0	30.5
80	16.5	25.5	19.5	20.0	18.0	19.5	19.5	19.0	25.0
70	14.0	21.0	14.5	15.0	14.5	16.0	16.0	15.5	16.5
60	11.5	16.0	11.5	11.0	11.5	12.0	14.0	14.0	12.5
50	9.5	13.5	9.0	9.0	10.0	10.0	12.5	11.5	12.0
40	9.0	10.0	7.5	8.0	8.5	9.0	11.0	10.0	11.5
30	6.5	8.5	6.5	7.0	8.0	7.0	9.5	9.0	11.0
20	6.0	7.0	5.5	6.0	7.0	6.5	8.0	8.0	8.5
10	5.0	5.5	4.5	5.0	5.0	5.0	6.5	6.0	7.0
0	4.0	4.5	3.5	4.0	3.0	4.0	5.0	5.0	5.0

TABLE XXV

FRONT THIGH SKINFOLD (FAT) MEASUREMENT

Per-centile	Age Levels								
	10	11	12	13	14	15	16	17	18
100	51.5	45.0	45.0	45.0	45.0	37.0	40.5	55.0	32.5
90	27.5	29.5	29.5	26.0	26.5	23.0	25.0	22.0	21.0
80	23.0	24.0	25.0	20.5	21.0	20.5	20.0	17.5	17.0
70	20.0	23.5	23.0	19.0	18.5	19.5	17.0	15.0	14.5
60	19.0	20.5	20.0	17.5	16.5	17.0	14.0	14.0	14.0
50	17.5	18.5	18.5	15.5	15.5	15.5	12.5	13.0	13.5
40	16.0	16.5	15.5	15.0	14.5	14.0	11.0	10.5	12.5
30	15.0	15.0	15.0	14.0	13.5	13.5	10.0	10.0	11.0
20	14.0	13.0	13.5	12.0	11.5	11.0	9.5	9.0	10.0
10	11.5	11.0	10.0	9.5	10.0	10.0	9.0	8.0	9.5
0	7.5	6.5	8.0	4.0	7.0	7.0	5.5	6.0	8.5

TABLE XXVI

FRONT THIGH SKINFOLD (FAT) MEASUREMENT

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	51.5	45.0	44.0	52.5	37.5	37.0	55.0	52.0	32.5
90	27.5	30.0	28.5	26.5	27.0	22.0	25.5	21.0	21.5
80	23.0	25.0	24.5	23.5	19.5	20.5	21.5	17.0	17.5
70	20.0	23.5	21.0	20.0	17.5	18.5	17.5	15.0	14.5
60	19.0	20.5	19.0	18.5	16.5	16.5	14.5	14.0	14.0
50	17.5	18.5	17.5	16.0	15.5	14.5	13.5	12.0	13.5
40	16.5	16.0	15.0	15.5	14.5	13.5	12.0	11.0	12.0
30	15.0	15.0	14.5	13.5	13.5	12.0	10.5	10.0	10.5
20	14.5	13.0	13.0	12.0	11.5	11.0	9.5	9.0	10.0
10	11.5	10.5	9.5	9.5	9.5	9.5	8.0	8.0	9.0
0	7.5	6.5	6.0	4.0	7.0	8.0	5.5	6.0	8.5

TABLE XXVII

TOTAL SKINFOLD (FAT) MEASUREMENT

Per-centile	Age Levels								
	10	11	12	13	14	15	16	17	18
100	210.5	172.0	204.0	186.0	228.0	188.0	199.0	282.0	205.0
90	89.5	126.5	107.5	93.0	108.0	103.5	112.0	108.5	132.5
80	76.5	102.0	94.5	74.0	74.0	92.5	77.0	84.5	93.5
70	69.0	88.0	82.5	63.5	67.0	76.0	64.0	72.5	71.5
60	58.5	74.5	62.0	53.5	60.0	66.0	53.5	63.5	64.5
50	53.5	66.0	55.0	49.0	53.0	60.0	48.5	59.0	60.5
40	50.0	57.0	50.0	45.0	49.5	54.0	46.5	47.5	53.0
30	47.5	53.0	46.5	41.5	45.0	48.0	43.0	44.5	49.0
20	41.0	44.5	40.5	39.5	41.0	41.5	38.0	42.0	45.5
10	34.5	39.5	35.0	32.0	38.0	37.0	35.5	36.5	39.0
0	28.0	30.0	27.0	22.0	22.0	31.0	16.5	31.0	33.5

TABLE XXVIII

TOTAL SKINFOLD (FAT) MEASUREMENTS

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	210.5	204.0	179.5	238.0	228.0	188.0	282.0	192.5	205.0
90	108.0	127.5	104.0	111.0	108.0	103.5	125.5	91.5	135.0
80	76.5	103.5	89.0	89.0	75.0	87.5	86.0	74.5	102.5
70	69.5	88.0	73.5	68.5	67.0	71.5	72.0	64.5	84.5
60	63.5	76.0	60.5	59.5	60.0	61.0	63.5	59.0	65.0
50	54.5	65.0	54.5	51.5	53.5	54.0	53.0	53.5	62.5
40	51.0	56.5	48.0	47.0	51.5	50.0	48.5	45.0	53.0
30	47.5	49.0	44.5	43.5	45.0	43.5	45.0	43.0	50.5
20	41.0	43.0	37.5	41.0	41.0	38.0	39.5	40.0	47.5
10	36.5	36.0	34.5	35.5	37.0	35.5	35.5	35.0	42.5
0	28.0	30.0	24.5	22.0	22.0	31.0	16.5	31.0	33.5

TABLE XXIX

600 YD. RUN-WALK

Per-centile	Age Levels								
	10	11	12	13	14	15	16	17	18
100	127	113	116	111	110	97	94	89	92
90	135	134	126	121	115	109	101	97	96
80	140	140	130	128	122	121	105	101	100
70	147	143	136	133	124	125	107	103	102
60	152	150	141	140	130	130	110	107	105
50	158	157	146	144	133	133	114	109	105
40	165	164	150	148	137	139	117	113	106
30	174	172	154	150	140	142	120	117	109
20	190	180	165	156	147	151	125	120	114
10	200	203	168	165	158	161	142	125	120
0	230	249	240	223	270	195	175	206	148

TABLE XXX

600 YD. RUN WALK

Per-centile	Grade Level								
	4	5	6	7	8	9	10	11	12
100	127	113	112	110	97	99	94	89	92
90	137	133	126	120	115	115	100	98	95
80	145	136	128	126	120	121	104	102	99
70	152	142	133	133	123	125	107	104	102
60	157	147	138	138	127	128	110	107	103
50	164	150	144	144	132	132	113	109	105
40	168	160	147	147	136	139	117	111	106
30	174	170	150	152	139	143	120	116	108
20	190	183	156	158	142	151	124	120	112
10	200	203	165	166	150	166	137	125	120
0	240	249	179	223	270	195	175	206	142

TABLE XXXI

PULL UPS

Per-centile	Age Levels								
	10	11	12	13	14	15	16	17	18
100	18	12	13	15	17	10	13	11	11
90	6	8	10	10	12	4	5	5	6
80	5	5	8	8	10	3	4	4	4
70	4	4	7	8	9	3	3	3	4
60	3	4	6	7	8	2	2	2	3
50	3	3	5	6	8	1	2	1	2
40	2	2	4	5	7	1	1	1	2
30	1	2	2	5	7	0	0	0	1
20	1	1	2	3	5	0	0	0	0
10	0	0	1	2	2	0	0	0	0
0	0	0	0	0	1	0	0	0	0

TABLE XXXII

PULL UPS

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	10	13	11	9	7	12	13	20	17
90	5	6	5	6	6	9	9	11	13
80	3	4	4	4	5	6	8	9	11
70	3	3	3	4	4	5	7	8	10
60	2	2	2	3	3	4	6	7	8
50	1	2	1	2	2	3	5	6	8
40	1	1	1	2	2	2	4	5	7
30	0	1	0	1	1	2	3	5	7
20	0	0	0	0	1	1	2	3	5
10	0	0	0	0	1	0	1	1	2
0	0	0	0	0	0	0	0	0	1

TABLE XXXIII

PUSH UPS

Per-centile	Age Levels								
	10	11	12	13	14	15	16	17	18
100	30	55	35	41	33	42	57	50	60
90	20	22	21	30	22	27	30	40	43
80	17	17	16	25	20	22	25	32	40
70	15	15	15	19	15	20	21	30	35
60	13	14	13	16	15	20	20	25	30
50	10	12	12	15	13	15	17	23	28
40	10	10	10	11	11	13	15	21	25
30	7	9	9	10	10	11	14	20	23
20	6	7	7	5	9	9	11	15	21
10	4	5	5	3	5	7	8	12	20
0	0	1	1	0	1	3	1	2	7

TABLE XXXIV

PUSH UPS

Per-centile	Grade Levels								
	4	5	6	7	8	9	10	11	12
100	30	55	41	37	33	42	57	50	60
90	20	23	21	30	20	28	30	40	43
80	17	18	16	25	20	25	25	35	40
70	15	15	15	20	15	21	21	30	35
60	13	14	13	16	14	20	20	26	32
50	10	12	11	15	12	20	17	25	30
40	9	11	10	12	10	15	15	22	25
30	7	9	9	10	10	12	14	20	23
20	6	6	7	6	7	10	11	15	21
10	5	5	5	4	5	8	10	12	20
0	0	1	2	0	1	3	1	2	7

	Number, Name_____, School_____
Col. 1-4	Date of Birth_____, Date of Testing_____
Col. 5-8	Grade Level_____
Col. 9-10	Strength. Trial 1_____, Trial 2_____
Col. 11-14	Agility. Trial 1_____, Trial 2_____
Col. 15-18	Power.
Col. 19-22	a. Standing Jump. Trial 1_____, Trial 2_____
	b. Softball Throw. Trial 1_____, Trial 2_____
Col. 23-26	Flexibility. Trial 1_____, Trial 2_____
Col. 27-29	Cardio-Pulmonary
Col. 30-32	Pulse Reading--1 min.--1 min. after test

	Anthropometric
Col. 33-36	a. Height. Trial 1_____, Trial 2_____
	b. Weight.
Col. 37-39	Fat Measurements
Col. 40-42	1. Arm. Trial 1_____, Trial 2_____
Col. 43-45	2. Subscapular. Trial 1_____, Trial 2_____
Col. 46-48	3. Hip. Trial 1_____, Trial 2_____
Col. 49-51	4. Abdomen. Trial 1_____, Trial 2_____
Col. 52-54	5. Front Thigh. Trial 1_____, Trial 2_____
Col. 55-58	6. Total Fat
	Muscular Endurance
Col. 59-62	1. 600 Yard Run-Walk
Col. 63-64	2. Chins
Col. 65-67	3. Push ups

FIGURE 1

SAMPLE TEST CARD

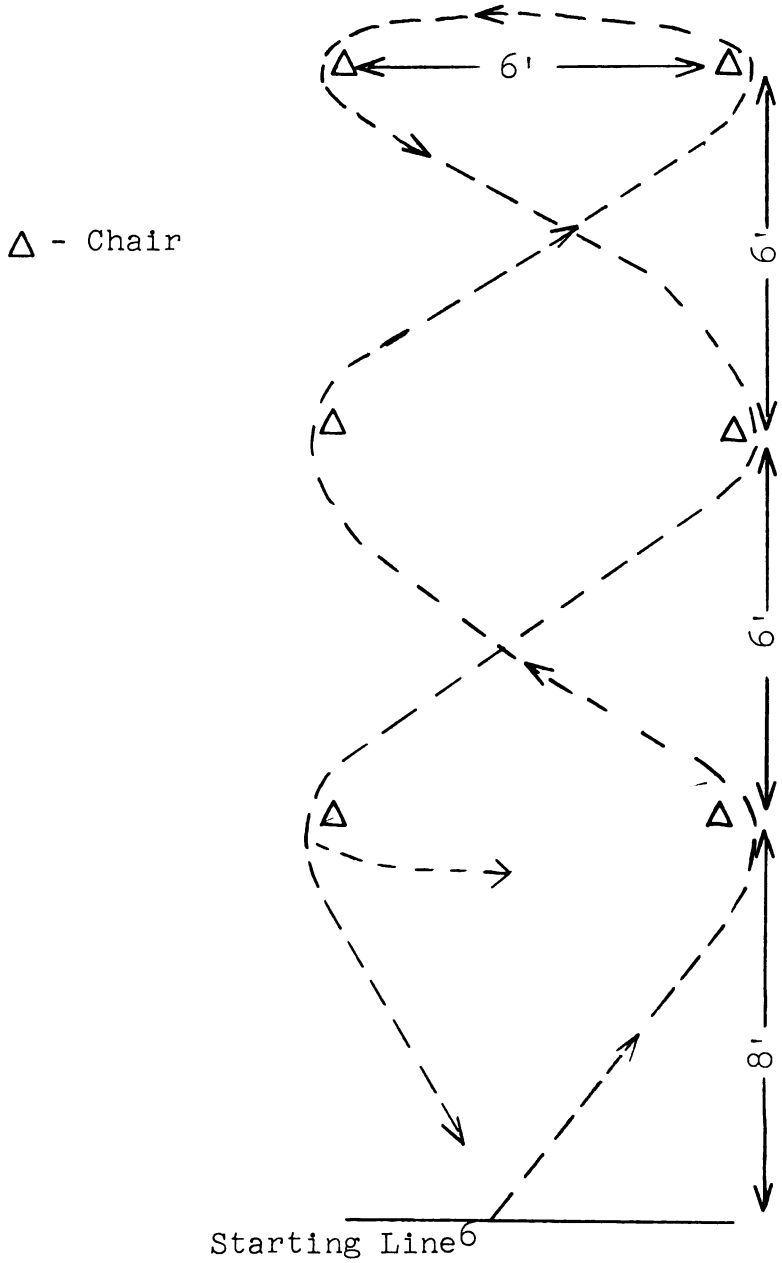

FIGURE 2

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[6] Ibid., p. 83