DEVELOPMENT OF BASKETBALL SKILL TEST NORMS FOR AUSTIN PEAY STATE UNIVERSITY COLLEGE FRESHMEN AND SOPHOMORES

A Research Paper

Presented to

the Graduate Council of

Austin Peay State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in Education

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by

Thomas Henning Murrey

August 1968

To the Graduate Council:

I am submitting here with a Research Paper written by Thomas Henning Murrey entitled "Development of Basketball Skill Test Norms for Austin Peay State University College Freshmen and Sophomores." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Education.

Dave Aaron
Major Professor

Accepted for the Council:

Wayne E. Hamby
Dean of Graduate School

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(2) faster reaction times, (3) better agility, and (4) more adaptness at shooting from all parts of the floor. Previous skill tests have either, included test items that were difficult to administer because of the equipment needed or, because there were too many items and subjects to be tested and too little time, consequently, many Physical Educators have used the "coaches view" of classifying subjects.

II. DEFINITION OF TERMS

Fast break game. "A situation in which the defensive team gains possession of the basketball and moves into scoring position so quickly that its members outnumber their opponents."[1]

Pressing game. "A forcing type defense in which the offense is picked up farther away from the basket than normal. The press may be of half-court, three-quarter court, or full-court type."[2]

Jump shot. "Prior to jumping into the air for the shot, hold the ball in both hands with your shoulders square to the goal and with your knees slightly bent. The jump into the air is made with an upward thrust by both legs. Height of the jump will vary with the individual, but it is important that your jump be as effortless as possible. As the jump is made the ball is brought to a position slightly above and in front of your head. Your left hand should be under the ball for

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[1] Glenn Wilkes, Men's Basketball, (Wm. C. Brown Co., Dubuque, Iowa, 1967), p. 47.

[2] Ibid., p. 48.

control and the back of your right hand should be facing you. It is very important that your right elbow be under the ball and on a line between you and the basket. Sight at the goal just under the ball. The shot is released by an upward movement of your right elbow and a simultaneous forward push of your forearm and wrist. Your wrist should snap completely forward to provide a good follow-through."[3]

Dribble. "A dribble is ball movement by a player who taps the ball in the air or on the floor, and then touches it once or several times or catches it. Such a dribble ends when the dribbler touches the ball with both hands simultaneously permits it to come to rest while he is in contact with it, or loses control of it."[4]

Subjects. The students participating in the "Development of Basketball Skill Test Norms for Austin Peay State University College Freshmen and Sophomores" shall be referred to in the future as subjects.

Coaches' view. Ability of a coach to view or observe basketball players in action, and by picking out (through performance) qualities that all good basketball players must have, and make a prediction of the future ability of the individual observed.

Validity. The degree to which a test measures what it sets out to measure.

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[3] Ibid., p. 5.

[4] Ibid., p. 54.

Norms. These are valid rating scales that under a particular set of criteria an individual of a certain ability would be expected to fall within a given range a majority of the time.

Standard deviation. "Is a measure of distribution commonly applied to any symmetrical bell-shaped distribution of scores approximating the normal curve."[5]

Standard error. The standard error may be easiest understood by observing the following formula: $\sigma_m = \frac{\sigma}{\sqrt{N-1}}$. This means that the standard error is computed by: (1) taking the number of cases involved and subtract 1 from it, (2) find the square root of this number, and (3) divide this number into the standard deviation.

Z Score. The Z Score is also called the standard score. It is the deviation from the arithmetic mean in standard deviation units. It may be easiest understood by observing the following formula: $Z = \frac{X-M}{\sigma}$. This means that the Z score is computed by dividing the standard deviation into the number arrived at after the raw score has been subtracted from the mean.

T Score. The T Score is simply expressing the Z Score in positive units either above or below a mean of 50. It may be easiest understood by observing the following formula: T Score=10(Z) + 50. This means

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[5]Gladys Scott and Esther French, Measurement and Evaluation in Physical Education, (Dubuque, Iowa, Wm. C. Brown Co., 1959), p. 29.

that the Z Score is multiplied by 10 and added to 50.

T Scale. A scale composed of T scores.

X. The X represents the raw score.

M. The M represents the arithmetic mean of the raw scores.

CHAPTER II

LIMITATIONS AND HYPOTHESES

The validity of the skill test would be based upon norms set by A. P. S. U. men. These norms would be established through the sampling discussed in the limitations of this Research Paper.

I. LIMITATIONS

1. The author was limited in his research to testing only those students, who had been enrolled in the summer session of Austin Peay State University, Clarksville, Tennessee, June 5, 1968, through August 1, 1968.
2. Those students tested were members of the freshman or sophomore class (any student who had not completed more than 100 hours of study in the university).
3. Subjects chosen for the testing were: (a) a member of a physical education class, (b) responding to notices of the testing placed in all post office boxes of freshman and sophomore men, (c) responding to the invitation extended by the author to be a part of the research, and (d) responding due to the notices posted and interest shown by other students, who had previously participated.
4. The author was limited to only one-hundred and four participants.

II. HYPOTHESES

1. Basketball skill tests must measure individual ability in

order to be valid and reliable.

2. Basketball skill tests do not have to include a large battery of test items in order to measure all basic aspects of playing ability.
3. Basketball skill tests may be constructed that would enable the Physical Educator to use court markings that are presently available on a regulation basketball court.
4. Basketball skill tests may be constructed that would allow other portions of the test to be given simultaneously.
5. Basketball skill tests may be constructed so that measuring devises currently possessed by the Physical Educator may be employed with very little degree of error.
6. Basketball skill tests should be constructed that would measure all of the physical skills possessed by present-day players.
7. Establishing a norm for a basketball skill test includes a random, representative sample of a particular portion of the population.

CHAPTER III

REVIEW OF LITERATURE

I. DESCRIPTION OF TESTS USED IN EIGHT DIFFERENT BASKETBALL SKILL TESTS

There were eight basketball skill tests reviewed and explained in the research paper. The tests reviewed were devised and used for college men and/or high school boys. A description of each test item was given within each group of individual skill tests. The five areas reviewed were: (1) shooting field goals and free throws, (2) dribbling and shooting and dribbling around obstacles, (3) wall bounce test for speed and accuracy, (4) passing for accuracy and speed, and (5) other tests included the "vertical jump," "running for speed," and "lay ups while dribbling."

Shooting field goals and free throws tests.

Bliss set up a shooting test where all shots were to be taken from a fifteen radius drawn from the baseline directly behind the basket. This meant that the distance to the goal from the point where the shot was taken was twelve feet. Ten trials were given each subject. Each shot after the first, was to be taken from the point where the rebounded ball crossed the radius previously established.[1]

Johnson made his subjects shoot as many shots as possible in thirty seconds from any distance from the basket they chose. One point was given for each shot made.[2]

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[1] J. G. Bliss, Basketball, (Philadelphia: Lea and Febiger, 1929), pp. 24-25.

[2] William L. Johnson, "Objective Test in Basketball for High School Boys," (unpublished master's thesis, State University of Iowa, Iowa City, Iowa, 1934), pp. 124-132.

Southern State College developed a shooting test using any shot from any distance for a time lapse of one minute. One point was given for each shot made.[3]

Stein had each subject shoot his ten shots from the crest of the top of the circle behind the foul line.[4] One point was given for each shot made.

Bliss included another shooting test, which required the subject to stand behind the foul line. Each subject was allowed ten trials. After each shot the subject was to step outside the foul circle and back again.[5]

Friermood had each subject shoot from behind the free throw line. But each subject was allowed to continue shooting as long as he hit every shot. When he missed, his turn had ended.[6]

Dribbling and shooting and dribbling around obstacles tests.

Bliss had his subjects stand behind a fifteen foot radius drawn from the baseline from behind the basket and instructed the subject to take the first shot from behind the semi-circle, and recover his ball and shoot from the point, where the ball had been recovered after taking one dribble. The best score was the number of baskets made in forty seconds.[7]

Edgren began his shooting test with his subjects behind the free-throw line. The subject shoots from the free-throw line and goes

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[3]Francis Stroup, "Game Results as a Criterion for Validating Basketball Skill Test," The Research Quarterly, 26:353-357, (October, 1955), pp. 134-136, (Magnolia, Arkansas).

[4]Julian U. Stein, "Better Basketball through Skill Classification Journal of Health," Physical Education and Recreation, Vol. 28, (November, 1957), pp. 10-16.

[5]Bliss, op. cit., pp. 26-28.

[6]H. T. Friermood, "Basketball Progress Tests Adaptable to Class Use," Journal of Health and Physical Education, 5 (1) 45, (January, 1934), pp. 45-47.

[7]Bliss, op. cit., pp. 29-31.

after the ball and returns to the free-throw line and continues to do this until he has done it five times. He is timed during this shooting period. The number of seconds taken to complete the five trials is divided by the number of shots made.[8]

Friermood devised a dribble and shooting test that emphasized accuracy. Each subject was instructed to shoot three lay ups from the same side of the floor. A point was given for each shot made.[9]

Knox incorporated dribbling with shooting by lining three chairs in a straight row fifteen feet apart with the starting line twenty feet away. The farthest chair from the starting line was fifteen feet from the basket. The subject was required to start and dribble around the chairs and make the basket and return to the finish line.[10]

Bliss conducted a dribbling test by having the subject dribble in place for thirty dribbles and make a complete turn to the left and to the right. The ball had to be bounced at least waist high.[11]

Edgren constructed a "dodging run" test for dribbling. He used a general motor athletic ability test. It was an area of eleven yards long and five yards wide marked off into parallel strips three feet wide. An obstacle was placed on the end of strip number one. Another obstacle was placed on strip number two, five yards from the end line of obstacle number one. Obstacle number three was placed nine yards down the third strip. The number four obstacle was placed seven yards down the fourth strip. Obstacle number five was placed on the lower end line of the fifth strip. It is eleven yards from the starting point. The subject was to run around each obstacle until reaching the last obstacle, then he was to sprint to the starting line and go through the same pattern of running a second time until he once again reaches the finish line. Only one trial was allowed. Each score was recorded to the nearest tenth of a second.[12]

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[8] H. O. Edgren, "An Experiment in the Testing of Ability and Progress in Basketball," Research Quarterly, 3 (1) 159, (March, 1932), pp. 180-183.

[9] Friermood, loc. cit.

[10] Robert Dawson Knox, "An Experiment to Determine the Relationship between Performances in Skill Tests and Success in Playing Basketball," (unpublished master's thesis, University of Oregon, Eugene, Oregon, June, 1937), pp. 79-82.

[11] Bliss, op. cit., pp. 32-33.

[12] Edgren, loc. cit.

Friermood constructed a dribbling test by establishing a four foot circle as a starting point and two standards fifteen feet apart from one another and fifteen feet from the circle. The subject was to dribble in figure eight fashion around the standards and return to the circle. Two trials were given each subject.[13]

Johnson placed four hurdles six feet apart with a distance of twelve feet to the first hurdle from the starting line. The subject must dribble around all the hurdles and return to the starting line and continue back through the chairs until thirty seconds has passed. A point was scored for each chair passed.[14]

Knox used the set-up for the speed dribble as he did for the shooting with speed. The only variation was that the subject was to stand on the starting line with the ball on the floor. When the signal was given and the clock was started, the subject picked up the ball and dribbled his route and crossed the finish line as fast as possible.[15]

Lehsten used the same general motor athletic ability test to test dribbling for speed with obstacles that Edgren used.[16]

Southern State College developed an obstacle dribble, where each subject was to dribble around four standards six feet apart in a figure eight pattern during a one minute time limit. A point was scored for each chair passed.[17]

Stein set up an obstacle dribble, where each subject was to dribble from one end of the floor to the other, and on the second and third trips, he was to dribble around four chairs that had been placed equi-distant from each baseline. The time was recorded to the nearest second.[18]

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[13] Friermood, loc. cit.

[14] Johnson, loc. cit.

[15] Knox, loc. cit.

[16] Carlson Lehsten, "A Measure of Basketball Skills in High School Boys," The Physical Educator, Vol. 5, No. 5, (December, 1948), pp. 147-151.

[17] Stroup, loc. cit.

[18] Stein, loc. cit.

Wall Bounce for Speed and Accuracy Test.

Bliss used a wall bounce "speed pass," as a test item. The subject must stand six feet from a line drawn away from a wall. A chest pass must be thrown and passed as many times as possible in twenty seconds. A point was scored each time the ball was caught.[19]

Edgren also used the wall bounce "speed pass," to measure a part of basketball playing ability. Each subject was instructed to stand eight feet from the wall behind a restraining line and bounce the ball ten times. The time was recorded to the nearest tenth of a second.[20]

Knox used a five foot restraining line as the subject tried to bounce the ball against the wall fifteen times as fast as possible. The time was recorded to the nearest tenth of a second.[21]

Lehsten devised a similar wall bounce test. It was taken from a distance of six feet from the wall. A rectangle two feet wide and four feet high was placed three feet from the floor. The subject was instructed to bounce the ball as many times as possible inside the rectangle, within the ten second time limit.[22]

Southern State College developed a wall bounce test that required each subject to stand behind a restraining line of seven feet. The subject was to bounce the ball as many times as possible in one minute.[23]

Stein chose a wall counce test that required each subject to stand behind a restraining line of five feet formed by a bench. Each subject was to bounce the ball as many times as possible in one minute.[24]

(Throwing) Passing for accuracy and speed.

Bliss devised a throw for accuracy. This test consisted of a circle: (1) forty-eight inches in diameter, (2) sixty inches from the

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[19] Bliss, op. cit., pp. 34-36.

[20] Edgren, loc. cit.

[21] Knox, loc. cit.

[22] Lehsten, loc. cit.

[23] Stroup, loc. cit.

[24] Stein, loc. cit.

floor, (3) with a restraining line twenty feet from a wall, and (4) each subject was allowed ten shots. One point was scored for each hit.[25]

Edgren also structured a passing test for accuracy using college men. He chose rectangles that were: (1) sixty inches by forty-eight inches, (2) forty inches by twenty-four inches, and (3) twelve inches by ten inches. A distance of fifteen feet was used for the first and second pass tests and a distance of thirty feet was selected for the third and fourth pass tests. The four pass tests were: (1) chest, (2) underhand, (3) two hand over-the-shoulder, and (4) two hand over-head pass.

Friermood devised a test of a similar nature for boys and men (12-30 years old). The target was forty-eight inches wide and thirty-six inches high. The rectangle stood fifty-four inches from the floor. The distance the subject must stand must be twenty feet. Each subject was given six trials.

Johnson made targets rectangular in shape. They were: sixty inches by forty inches, (2) forty inches by twenty-five inches, and (3) twenty inches by ten inches. The large rectangle is fourteen inches from the floor. Ten trials were given each subject.[26]

Stein called his accuracy test a "chest pass." His target, which could vary in size, was fifteen feet from any wall.[27] A point was scored for each hit. Each subject was given ten points.

Other test items.

Knox used a test called the penny cup test (running for speed) to measure the reaction time, while running and reacting to a given command. The subject was to run eight feet and then a command of either "red," "white," or "blue," was given. The subject, while running must go to the color of the cup called out and place the penny in the cup. The cups were placed five feet apart parallel to the command line twelve feet away from it.[28]

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[25] Bliss, op. cit., pp. 37-39.

[26] Johnson, loc. cit.

[27] Stein, loc. cit.

[28] Knox, loc. cit.

Lehsten used a forty-foot dash as one of the test items in his skill test. The score was recorded to the nearest tenth of a second.[29]

Stein used a second shooting test to check basketball playing ability. This was the "lay-up test." Each subject was to shoot as many lay ups as possible within one minute. The subject could shoot from any distance he chose.[30]

II. RELIABILITY OF THE EIGHT SKILL TESTS

Bliss. The test produced by Bliss failed to show the results of a coefficent of correlation.

Edgren. The test produced by Edgren showed a reliability of .73.

Friermood. The test produced by Friermood failed to show the results of a coefficient of correlation.

Johnson. The test produced by Johnson showed a reliability of .88.

Knox. The test produced by Knox showed a reliability of .88.

Lehsten. The test produced by Lehsten showed a reliability of .80.

Southern State College. The test produced by Southern State College showed a reliability of .83.

Stein. The test produced by Stein failed to show the results of a coefficient of correlation.

III. BASKETBALL SKILL TEST MASTER CHART FOR COLLEGE MEN AND HIGH SCHOOL BOYS

Eight basketball skill tests were researched and plotted on a

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[29] Lehsten, loc. cit.

[30] Stein, loc. cit.

master chart. The eight authors of the tests were: (1) J. G. Bliss, (2) H. D. Edgren, (3) H. T. Friermood, (4) W. L. Johnson, (5) R. D. Knox, (6) C. Lehsten, (7) F. Stroup (referred to as Southern State College), and (8) J. U. Stein.

The master chart marks those test items that were included in that author's particular test. The master chart may be seen by looking to Chart I.

IV. MEASUREMENT AND EVALUATION OF SKILL TESTS IN PHYSICAL EDUCATION

Skill Test Axioms. "Those teachers interested in developing their own tests will find these suggestions valuable."

1. "An excessively long test will have little utilization.
2. Accuracy may be sacrificed for administrative ease.
3. Objectivity is desirable but not absolutely necessary.
4. Test items should have a recognizable relation to the sport.
5. Frequently the order of the test items is important.
6. A reasonable range of scores is an asset.
7. The influence of extraneous factors should be held to a minimum."[31]

Limitations of Skill Tests.

1. "For the most part, their administration is often prohibitively time-consuming.
2. Many skill tests have not been proved for reliability and objectivity.

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[31]Francis Stroup, Measurement in Physical Education, (New York: The Ronald Press Company, 1957), p. 130.

3. The validity of many skill tests has not been determined."[32]

Reliability and Objectivity of Test Items. It has been generally agreed upon that accepted numerical values have been put upon reliability and objectivity in certain skill test areas. These numerical standards are: (1) High = .90 and above, (2) Moderate = .80 to .90. and (3) Low = below .79.

Larson and Yocom present a table concerning the reliability and objectivity of some skill test items that are designed to measure sport motor skills. They include a table that states that skill tests measuring the following are: (1) dribbling--moderate reliability, (2) passing--moderate reliability, (3) shooting for accuracy--low reliability, (4) shooting long shots for distance--low reliability, (5) shooting for accuracy and speed--low reliability, and (6) jumping--high reliability.[33]

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[32]Stroup, op. cit., pp. 262-263.

[33]Leonard A. Larson and R. D. Yocom, Measurement and Evaluation in Physical, Health, and Recreation Education, (St. Louis: The C. V. Mosby Company, 1951), p. 210.

CHART I

BASKETBALL SKILL TEST MASTER CHART FOR COLLEGE MEN AND HIGH SCHOOL BOYS

Authority	Group Tested	Shooting		Dribble and Shoot	Obstacle	Wall Bounce		Passing	Other Tests
		Field Goals	Free Throws			Speed	Accuracy	Accuracy and Speed	
Bliss	College men	X	X	X	X	X		X	
Edgren	College men			X	X	X		X	
Friermood	Boys and men		X	X	X			X	
Johnson	High School Boys	X			X			X	
Knox	High School Boys			X		X		X	Running for Speed
Lehsten	High School Boys				X	X			Vertical Jump
Southern State College	College men	X			X	X			
Stein	High School Boys	X			X	X	X		Lay ups

CHAPTER IV

REPORT OF THE STUDY

SELECTION OF SUBJECTS AND PROCEDURES

The author has experienced apathy and eagerness toward the taking of the skill test, while attempting to secure an adequate sampling of subjects. The procedures were constructed so that each subject tested would be able to complete the five tests in a minimum of time. It was estimated that an individual could complete the test on the average between fifteen and twenty minutes.

I. SELECTION OF SUBJECTS

Physical education classes. A greater number of the subjects participating were enrolled in the summer term at Austin Peay State University, Clarksville, Tennessee, June 5, 1968, through August 1, 1968.

Freshman and sophomore subjects. Those subjects tested were members of the freshman or sophomore class (any subject who had not completed more than 100 hours of study in the university).

Solicited. The author took it upon himself to personally invite any individual (either freshman or sophomore) on campus, friend or otherwise, that he met during the normal activities of each school day within the limits of the dates memtioned.

Personal notes. The author saw that notices were placed in the boxes of all eligible subjects at the post office on campus.

Signs. Signs were located in the gym, men's locker room, basement bulletin board in the Student University Center, and on the bulletin board at Cross Hall.

II. PROCEDURES

Orientation. Each subject was allowed to warm-up for 5 minutes prior to the taking of the basketball skill test. During this period each subject was informed on such matters as: (1) why the test was being given, (2) the different skill tests to be administered, (3) that he was not to be graded, but that only his number of points or scores made would be recorded, and (4) that he should try and do his very best.

Order of procedure. Every subject progressed from the first to the last skill test in the same order. The order of testing was: (1) Vertical Jump Test, (2) Running Test, (3) Dribbling Test, (4) Shooting Test, and (5) Throwing Test.

CHAPTER V

SKILL TESTS AND EQUIPMENT USED

The skill tests used were chosen because they could easily be used with a minimum amount of preparation before administering. Another criterium was that the measurement equipment be simple and yet accurate, adequate and yet available to the majority of Physical Educators.

I. SKILL TESTS

VERTICAL JUMP TEST

Instructions. The same instructions were given to each subject prior to his vertical jump test.

The purpose of this test is to measure one's thrusting ability as measured in a vertical jump. You are to: (1) stand with the chalk between your fingers, (2) close to the wall, (3) flat footed, (4) mark at the highest point of your reach, and (5) then return your arm to a normal position and crouch and spring up to the height of your jump and mark the wall with chalk as you reach your peak. The difference between the mark made standing and the highest mark made jumping shall be recorded as your vertical jump. You shall be given three trials and the best jump shall be recorded. Are there any questions?

RUNNING TEST

Instructions. The same instructions were given to each subject prior to his running test.

The purpose of this test is to measure speed, while running forward, backward, and side-stepping. You will: (1) stand with your heels on the baseline, (2) at the command ready-set-go, you will run backwards until you have cleared the chairs placed at the top of the key hole,

then (3) you will side-step to the right until your right foot becomes parallel to the chair placed as a marker, then (4) you shift your weight to your left and side-step back across the top of the key until your left foot comes parallel to the chair placed as a marker, (5) shifting your weight again to the right, you side-step back to the top of the key, and (6) run forward as fast as you can past the baseline. You shall be given three trials and the best time (lowest score) shall re recorded. Are there any questions?

DRIBBLING TEST

Instructions. The same instructions were given to each subject prior to his dribbling test.

The purpose of this test is to measure the speed of dribbling through a maze constructed that would include dribbling: (1) forward, (2) backward, (3) right-handed, and (4) left-handed. You must start with your foot on the intersection of the lines forming a right angle by the baseline and the left foul lane (as you face the court). I shall dribble the route you must dribble. At the command of ready-set-go, you will begin and be sure not to touch a chair, or forget to dribble backwards between the last two chairs, and then dribble forward as fast as possible across the baseline. You shall be given three trials and the best time (lowest score) shall be recorded. Are there any questions?

SHOOTING TEST

Instructions. The same instructions were given to each subject prior to his shooting test.

The purpose of this test is to measure the ability to hit field goals from various selected spots on the court. You shall take three practice shots from each position marked from a radius of fifteen feet from the back of the rim. There are small pieces of tape to identify each spot. After you have taken your three practice shots you must shoot two jump shots from the foul lane and then moving to your right shoot two shots from each mark. After you have completed shooting from that side you return to the foul lane and shoot two more shots, and moving to your left, shoot at each spot until you have completed the shooting of twenty shots at the baseline. You shall be given one point for each basket made. Are there any questions?

THROWING TEST

Instructions. The same instructions were given to each subject prior to his throwing test.

The purpose of this test is to measure accuracy of throwing a basketball, while dribbling. You are to: (1) start dribbling from behind the mid-court line toward the right side of the court, which has the out-stretched tape measure on the court, (2) dribble toward the tape, (3) throw and release the basketball before you cross the tape measure. You shall be given three trials to orient your distance to your throw. You shall have ten trials. You must make your ten shots consecutive and you throw the ball in any manner you choose. You shall be given: (1) one point for each time you hit the back board, (2) two points for each time you hit the rim, and (3) points each time you make the basket. Are there any questions?

II. EQUIPMENT USED

Basketball. A regulation basketball was used. It was inflated to the proper amount of air pressure (7-9 pounds of pressure).

Chalk. White, board chalk was used to "mark" in the vertical jump test.

Stop watch. An offical track stop watch measuring seconds and one-tenths of a second was used.

Metal tape measure. A metal tape measure was used to "mark" for the throwing test and measure the inches jumped in the vertical jump.

White adhesive tape. White adhesive tape was used to "mark" the shooting spots in the shooting test.

Metal folding chairs. Metal folding chairs were used as "markers" in the running test and dribbling test.

CHAPTER VI

RESULTS OF THE STUDY

I. TEST ITEMS, NUMBER OF SUBJECTS, MEAN, STANDARD DEVIATION STANDARD ERROR

Vertical Jump Test. The total number of subjects participating was 104. The mean height of the vertical jump was 20.20 inches. The standard deviation was 3.58. The standard error was .35.

Running Test. The total number of subjects participating was 104. The mean running speed was 9.10 seconds. The standard deviation was 1.19. The standard error was .12.

Dribbling Test. The total number of subjects participating was 104. The mean dribbling speed was 11.01 seconds. The standard deviation was 2.23. The standard error was 122.

Shooting Test. The total number of subjects participating was 104. The mean shooting score (the number of baskets made) was 6.28. The standard deviation was 3.60. The standard error was .35..

Throwing Test. The total number of subjects participating was 104. The mean throwing score was 12.88. The standard deviation was 4.91. The standard error was .48.

II. COMPOSITE 5 TEST TOTAL SCALE SCORE T SCALE PERCENTAGE REATING SCALE

Composite 5 Test Total Scale Score. All five of the skill tests

were computed from raw scores to a T scale. The formula may be seen in Appendix A. The mean of the T scale = 50. Thus, the mean of the five skill tests would be 250. Total five skill test scores may be plotted on the Percentage Rating Scale to see where the individual performs in relation to his group.

T Scale. The T Scale represents the scores an individual would have to make on a particular skill test to fall within a certain performing ability group.

Percentage Rating Scale. The author used a method of grading giving the greatest majority of scores near the mean an "average" grade. This average grade was given to the scores falling ½ standard deviation on either side of the mean. The grade "below average" and "above average" was given to those subjects 1½-½ standard deviations above and below the mean. The grade of "poor" and "superior" was given to those subjects scoring 3-2 standard deviation above and below the mean.

III. RAW SCORES, Z SCORES, T SCORES FOR THE VERTICAL JUMP TEST, RUNNING TEST, DRIBBLING TEST, SHOOTING TEST, THROWING TEST

The raw scores, Z scores, and T scores are given for all the skill tests. When the test is administered, any individual may follow across the page from raw score and immediately have his computed T scale score. After having found his T scale score for all five skill tests,

the subject would have only to add up his five T scale scores to find out how he ranked against his fellow subjects.

IV. OGIVE CURVE SHOWING PERCENTILE EQUIVALENTS OF THE VERTICAL JUMP TEST, RUNNING TEST, DRIBBLING TEST, SHOOTING TEST, THROWING TEST

The ogive curve shows the percentile equivalents of raw scores for the: (1) Vertical Jump Test, (2) Running Test, (3) Dribbling Test, (4) Shooting Test, and (5) Throwing Test.

CHAPTER VII

SUMMARY AND CONCLUSION

I. SUMMARY

The skill tests constructed were similar in nature to those previously given by the authorities reviewed. The major difference in the design of the skill tests constructed by the author was that they could be administered without: (1) any special equipment other than the equipment available to the average Physical Education Department, (2) an elaborate system of marking and measuring of the court area in preparation for the test, and (3) interfering with other test items that were being completed on another portion of the playing area.

The skill tests reviewed did not include a large number of test items, nor did they all include the same items. The author chose one test from each of the areas reviewed and constructed an original skill test using previous authority's basic ideas. This made the author's complete test battery include five skill tests.

Each skill test item included in the test battery was found to be significant at the five per cent level. This was arrived at by finding the standard error of the mean. Table I shows the mean, standard deviation, and standard error. This means that 68.26 per cent of the time, if the same skill tests were given to the same subjects 100 times, the mean would cluster around the real mean, plus or minus, the standard error for the test.

There were only six marks that needed to be made on the floor for the shooting test. These marks were found by stretching a tape fifteen feet from the floor below the back of the rim, and placing three equi-distant from the corner of the free-throw lane to an extended distance stretching fifteen feet from the edge of the backboard. All of the other tests could be marked by using established regulation basketball court markings.

II. CONCLUSION

Since the norms established for the five skill test items were significant at the five per cent level of confidence, if may be assumed that the norms were established through a random, representative sample of the freshman and sophomore men students enrolled at Austin Peay State University, Clarksville, Tennessee, during the summer session.

There were no coefficient of correlation results from this one-test survey of basketball ability. Thus, it would be advisable for those Physical Educators, who intend to use the norms established by the Austin Peay State University men, to administer the test to the group and check the test's validity and reliability by applying the original results to the new-found results through the coeffecient of correlation formula. Perhaps, if more subjects had been chosen and a larger sampling obtained, slightly different results would have been achieved. Several factors may have affected the outcome of the test over which the author was unable to control (e.g. personal incentive, and enviormental conditions--temperature and humidity...).

In conclusion, if the skill tests were no more than a motivator to those who were poor, a challenge to those who were average, and reliable in its judgements of the superior, it would have proven itself worthy of the time spent in administering and tabulating.

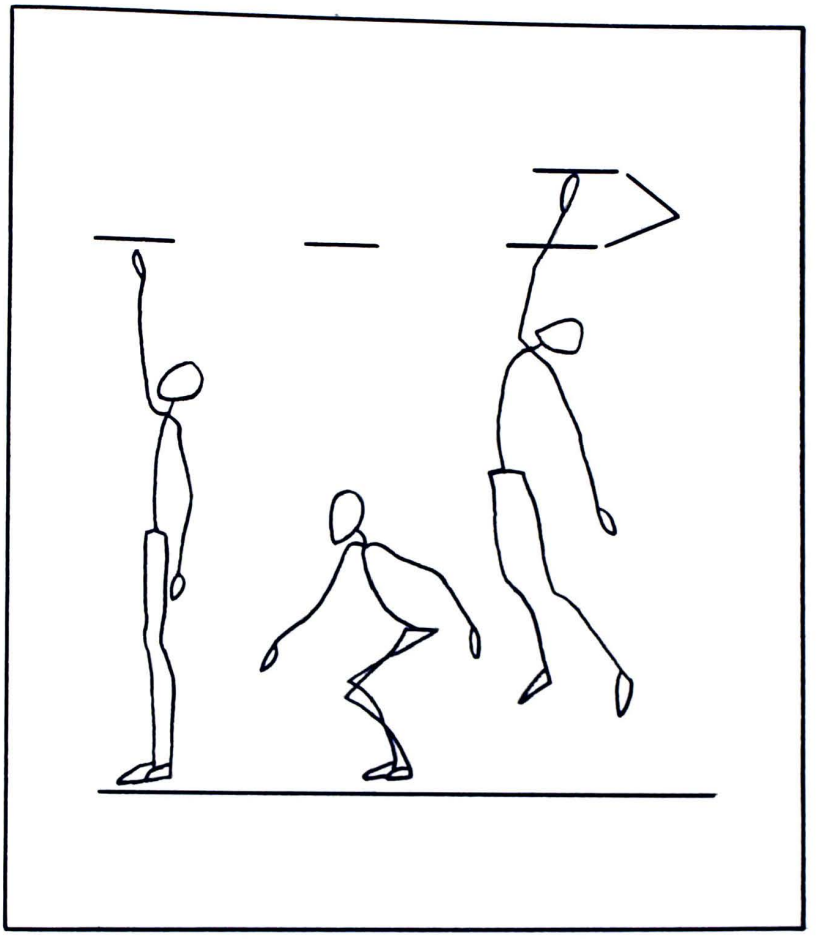
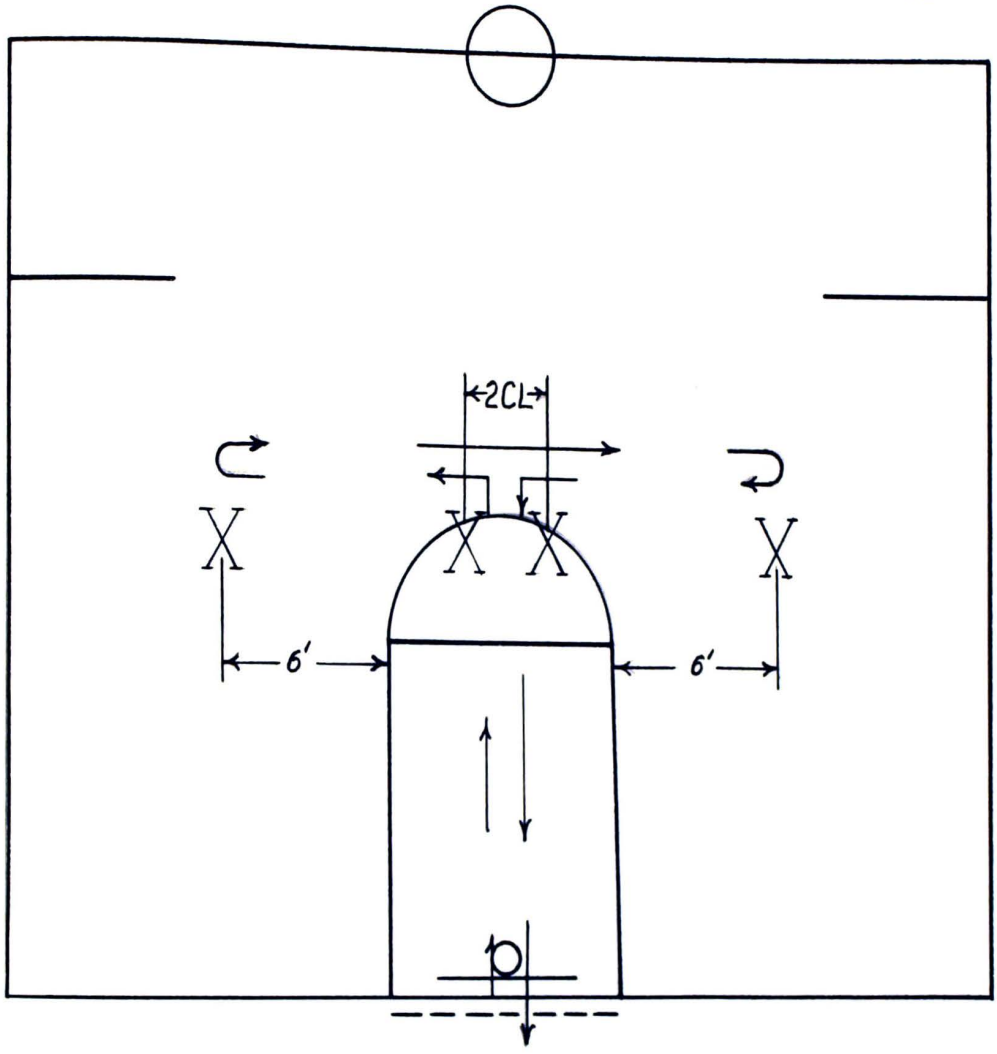


ILLUSTRATION I

JUMPING DIAGRAM
VERTICAL JUMP TEST

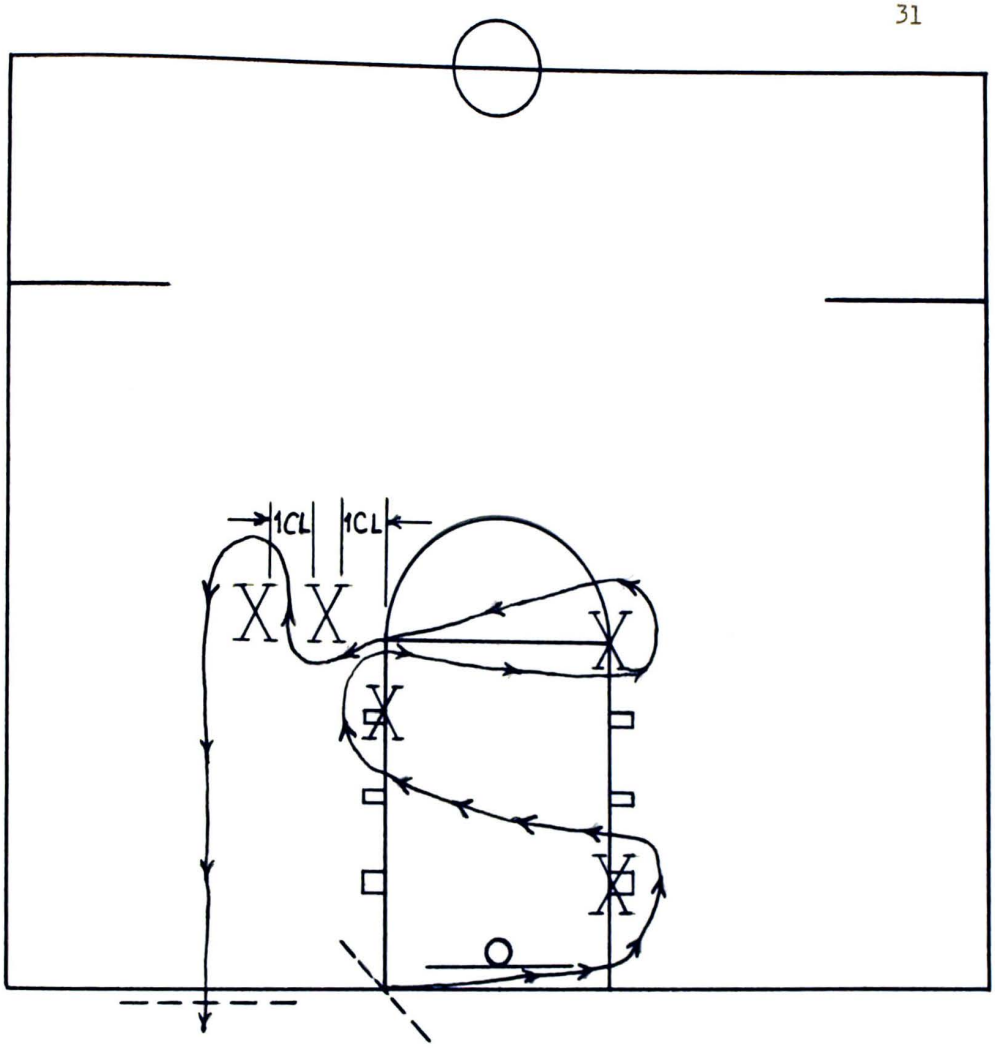


X = Represents a chair marker

2CL = Represents two chair lengths

ILLUSTRATION II

BASKETBALL COURT DIAGRAM
POSITION OF CHAIRS DURING THE RUNNING TEST

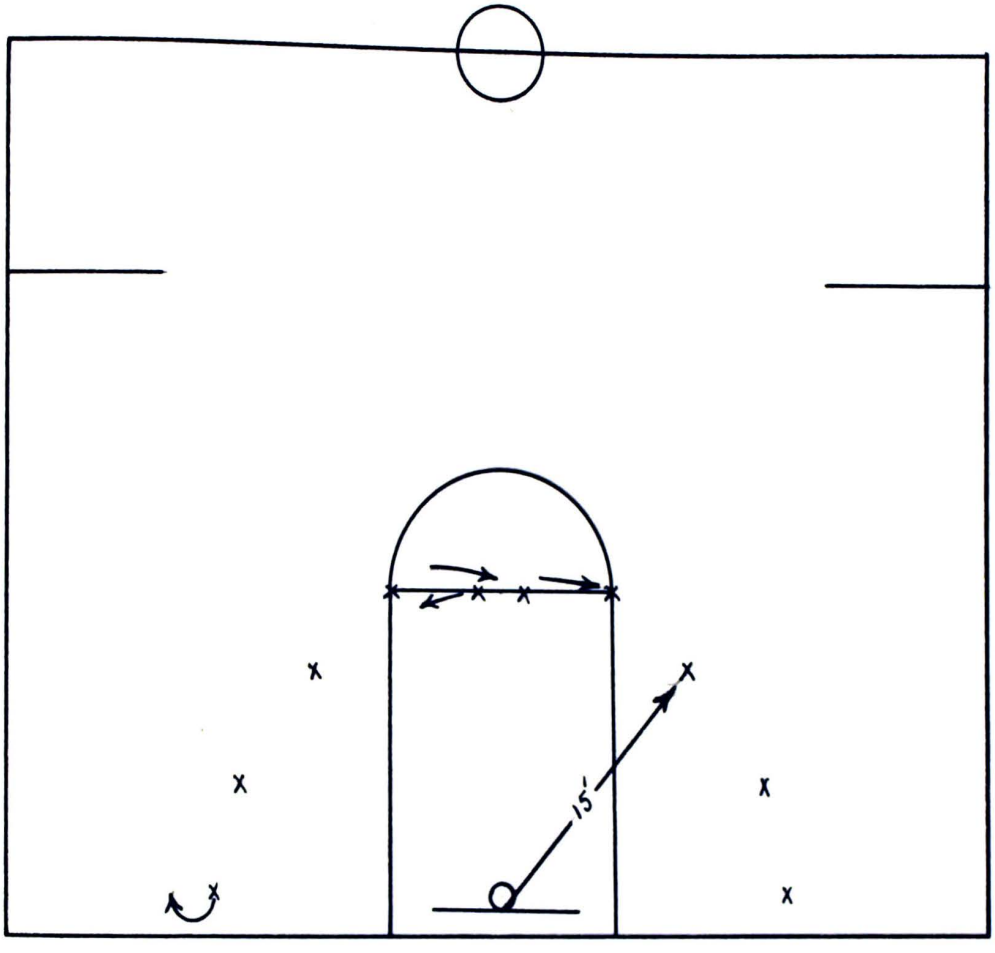


X = Represents a chair

1CL = One chair length

ILLUSTRATION III

BASKETBALL COURT DIAGRAM
POSITION OF CHAIRS DURING THE DRIBBLING TEST



X = Represents a tape marker

ILLUSTRATION IV

BASKETBALL COURT DIAGRAM
PLACEMENT OF MARKERS DURING SHOOTING TEST

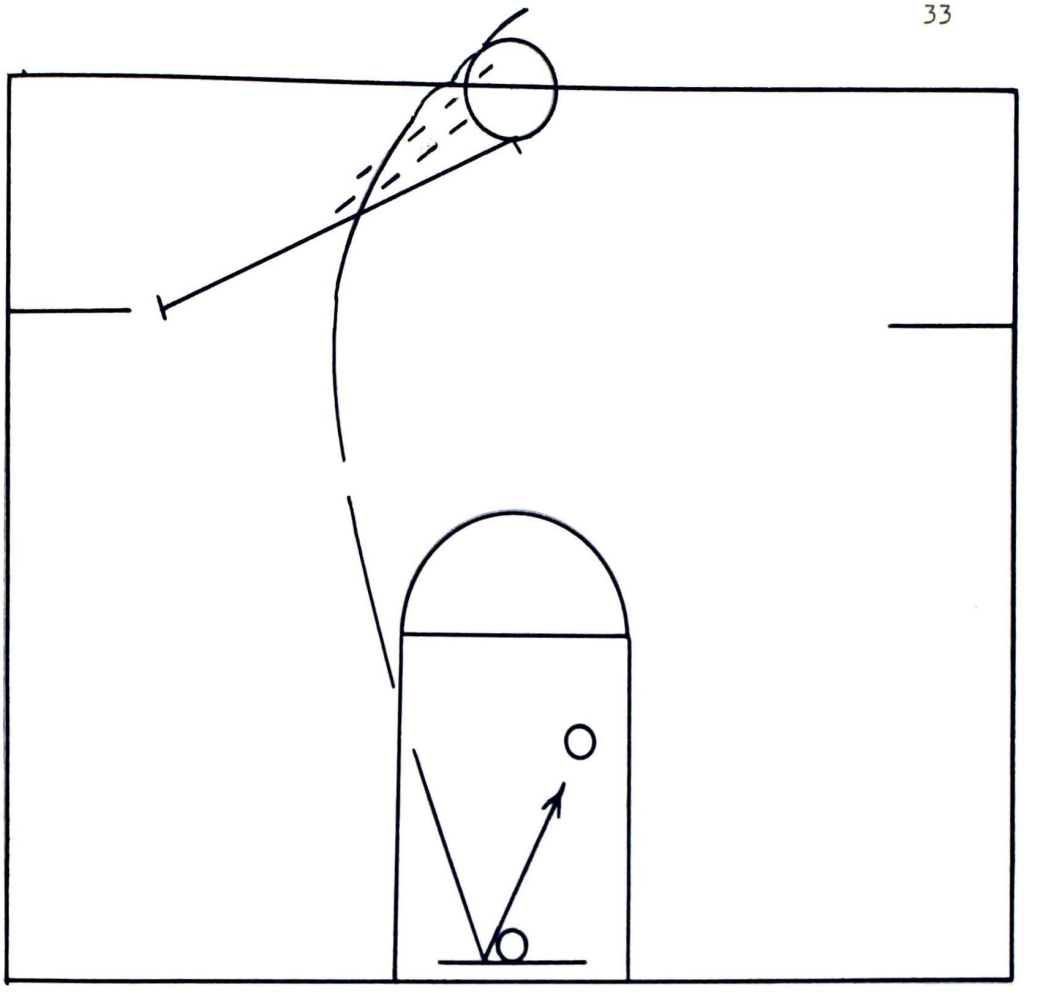


ILLUSTRATION V

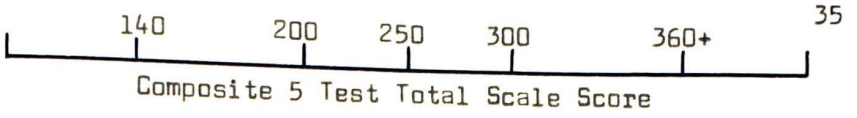
BASKETBALL COURT DIAGRAM FOR
THROWING TEST

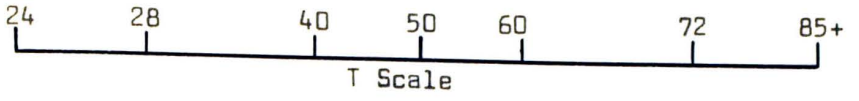
TABLE I

TEST ITEMS, NUMBER OF SUBJECTS, MEAN, STANDARD DEVIATION, STANDARD ERROR

TEST ITEM	N	M	σ	σ_M
Vertical Jump+	104	20.20	3.58	.35
Running*	104	9.10	1.19	.12
Dribbling*	104	11.01	2.23	.22
Shooting	104	6.28	3.60	.35
Throwing	104	12.88	4.91	.48

*This test item was timed and recorded to the nearest tenth of a second. +This test item was recorded to the nearest inch marked.





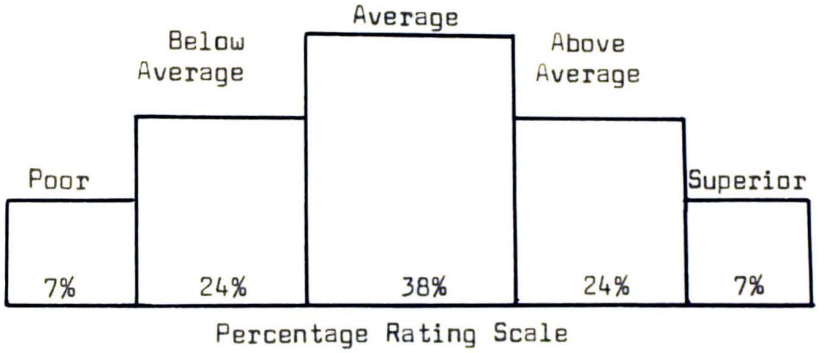


TABLE II

Composite 5 Test Total Scale Score
T Scale
Percentage Rating Scale

TABLE III

RAW SCORES, Z SCORES, T SCORES ON THE VERTICAL JUMP TEST

Raw Scores	Z Scores	T Scores
30	+2.74	77
29	+2.46	75
28	+2.18	72
27	+1.90	69
26	+1.62	66
25	+1.34	63
24	+1.06	61
23	+ .78	58
22	+ .50	55
21	+ .22	52
20	- .06	51
19	- .34	47
18	- .61	44
17	- .89	41
16	-1.17	38
15	-1.45	36
14	-1.73	33
13	-2.01	30
12	-2.29	27
11	-2.57	24
10	-2.85	24
9	-3.13	19
8	-3.41	16
7	-3.69	13
6	-3.97	10
5	-4.25	8
4	-4.53	5
3	-4.80	2

$m = 20.20$

$\sigma = 3.58$

$\sigma_m = .35$

TABLE IV

RAW SCORES, Z SCORES, T SCORES ON THE RUNNING TEST

Raw Scores	Z Scores	T Scores
12.0	243	26
11.9	235	27
11.8	227	28
11.7	219	28
11.6	210	29
11.5	202	30
11.4	193	31
11.3	185	32
11.2	176	33
11.1	168	33
11.0	159	34
10.9	151	35
10.8	143	36
10.7	134	37
10.6	126	38
10.5	118	38
10.4	109	39
10.3	101	40
10.2	.92	41
10.1	.84	42
10.0	.76	42
9.9	.67	43
9.8	.59	44
9.7	.50	45
9.6	.42	46
9.5	.34	47
9.4	.25	48
9.3	.17	48
9.2	.08	49
9.1	0	50
9.0	.08	51
8.9	.17	52
8.8	.25	53
8.7	.34	53
8.6	.42	54
8.5	.50	55
8.4	.59	56
8.3	.67	57
8.2	.76	58
8.1	.84	58
8.0	.92	59
7.9	1.01	60
7.8	1.09	61
7.7	1.18	62
7.6	1.26	63
7.5	1.34	63
7.4	1.43	64
7.3	1.51	65
7.2	1.59	66
7.1	1.68	67

TABLE V

RAW SCORES, Z SCORES, T SCORES ON THE DRIBBLING TEST

Raw Score	Z Score	T Score	Raw Score	Z Score	T Score
15.0	-1.80	32	11.1	- .04	50
14.9	-1.75	33	11.0	.00	50
14.8	-1.70	33	10.9	+ .04	50
14.7	-1.65	34	10.8	+ .09	51
14.6	-1.61	34	10.7	+ .13	51
14.5	-1.57	35	10.6	+ .18	52
14.4	-1.52	35	10.5	+ .23	52
14.3	-1.48	35	10.4	+ .27	53
14.2	-1.43	36	10.3	+ .32	53
14.1	-1.39	36	10.2	+ .36	54
14.0	-1.34	37	10.1	+ .41	54
13.9	-1.30	37	10.0	+ .45	55
13.8	-1.25	37	9.9	+ .50	55
13.7	-1.21	38	9.8	+ .54	55
13.6	-1.16	38	9.7	+ .59	56
13.5	-1.12	39	9.6	+ .63	56
13.4	-1.07	39	9.5	+ .68	57
13.3	-1.03	39	9.4	+ .72	57
13.2	- .98	40	9.3	+ .77	58
13.1	- .94	41	9.2	+ .81	58
13.0	- .89	41	9.1	+ .86	59
12.9	- .85	42	9.0	+ .90	59
12.8	- .80	42			
12.7	- .76	42			
12.6	- .71	43			
12.5	- .67	43			
12.4	- .62	44			
12.3	- .58	44			
12.2	- .53	45			
12.1	- .49	45			
12.0	- .44	46			
11.9	- .40	46			
11.8	- .35	47			
11.7	- .31	47			
11.6	- .26	47			
11.5	- .22	48			
11.4	- .17	48			
11.3	- .13	49			
11.2	- .09	49			

$m = 11.01$

$\sigma = 2.23$

$\sigma_m = .22$

TABLE VI

RAW SCORES, Z SCORES, T SCORES ON THE SHOOTING TEST

Raw Scores	Z Scores	T Scores
20	+3.92	88
19	+3.53	85
18	+3.25	83
17	+2.97	80
16	+2.70	77
15	+2.42	74
14	+2.14	71
13	+1.86	69
12	+1.58	66
11	+1.31	63
10	+1.03	60
9	+ .75	58
8	+ .47	55
7	+ .20	52
6	- .07	50
5	- .35	46
4	- .63	44
3	- .89	41
2	-1.18	39
1	-1.49	36
0	-1.80	33

$m=6.28$
$\sigma=3.60$
$\sigma_m= .35$

TABLE VII

RAW SCORES, Z SCORES, T SCORES ON THE THROWING TEST

Raw Scores	Z Scores	T Scores
30	+3.49	85
29	+3.28	83
28	+3.07	81
27	+2.88	79
26	+2.67	77
25	+2.47	75
24	+2.26	73
23	+2.06	71
22	+1.86	69
21	+1.65	67
20	+1.45	65
19	+1.25	63
18	+1.04	60
17	+ .84	58
16	+ .64	56
15	+ .43	54
14	+ .23	52
13	+ .02	50
12	- .18	48
11	- .38	46
10	- .59	44
9	- .79	42
8	- .99	40
7	-1.20	38
6	-1.40	36
5	-1.60	34
4	-1.81	32
3	-2.01	30
2	-2.22	28
1	-2.42	26
0	-2.62	24

$m = 12.88$
$\sigma = 4.91$
$\sigma_m = .48$

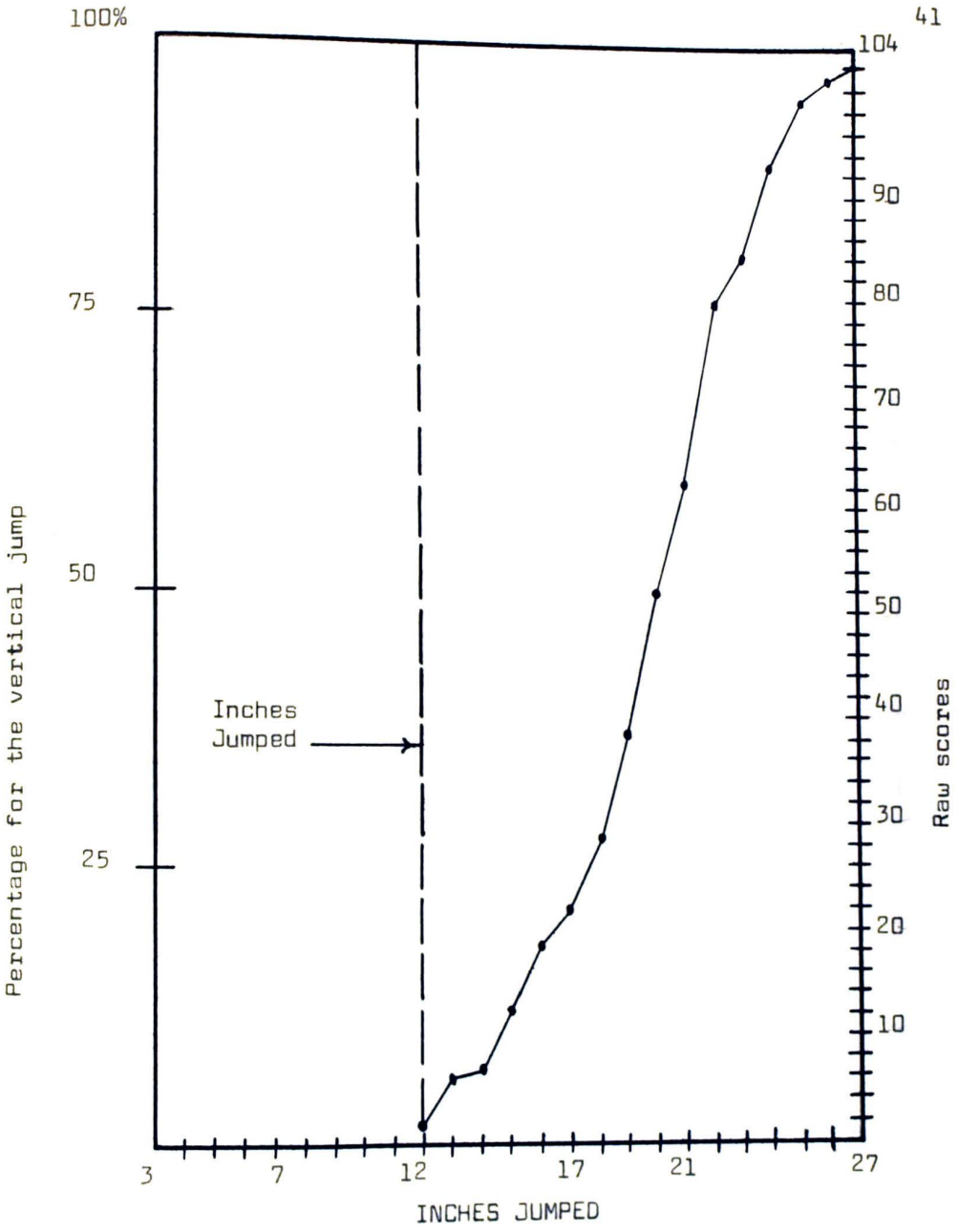


TABLE VIII

OGIVE CURVE SHOWING PERCENTILE EQUIVALENTS OF THE VERTICAL JUMP TEST

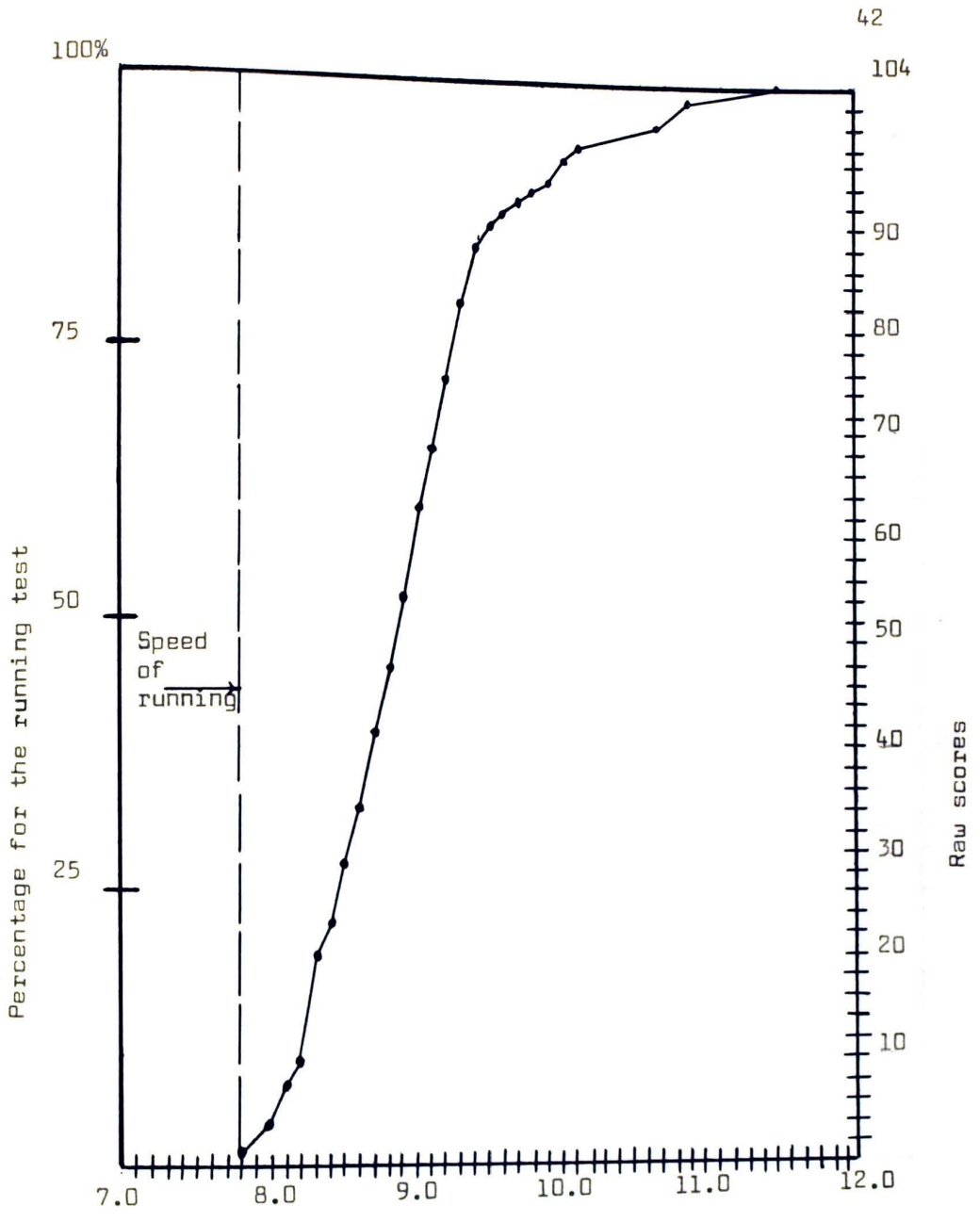


TABLE IX

OGIVE CURVE SHOWING PERCENTILE EQUIVALENTS OF THE RUNNING TEST

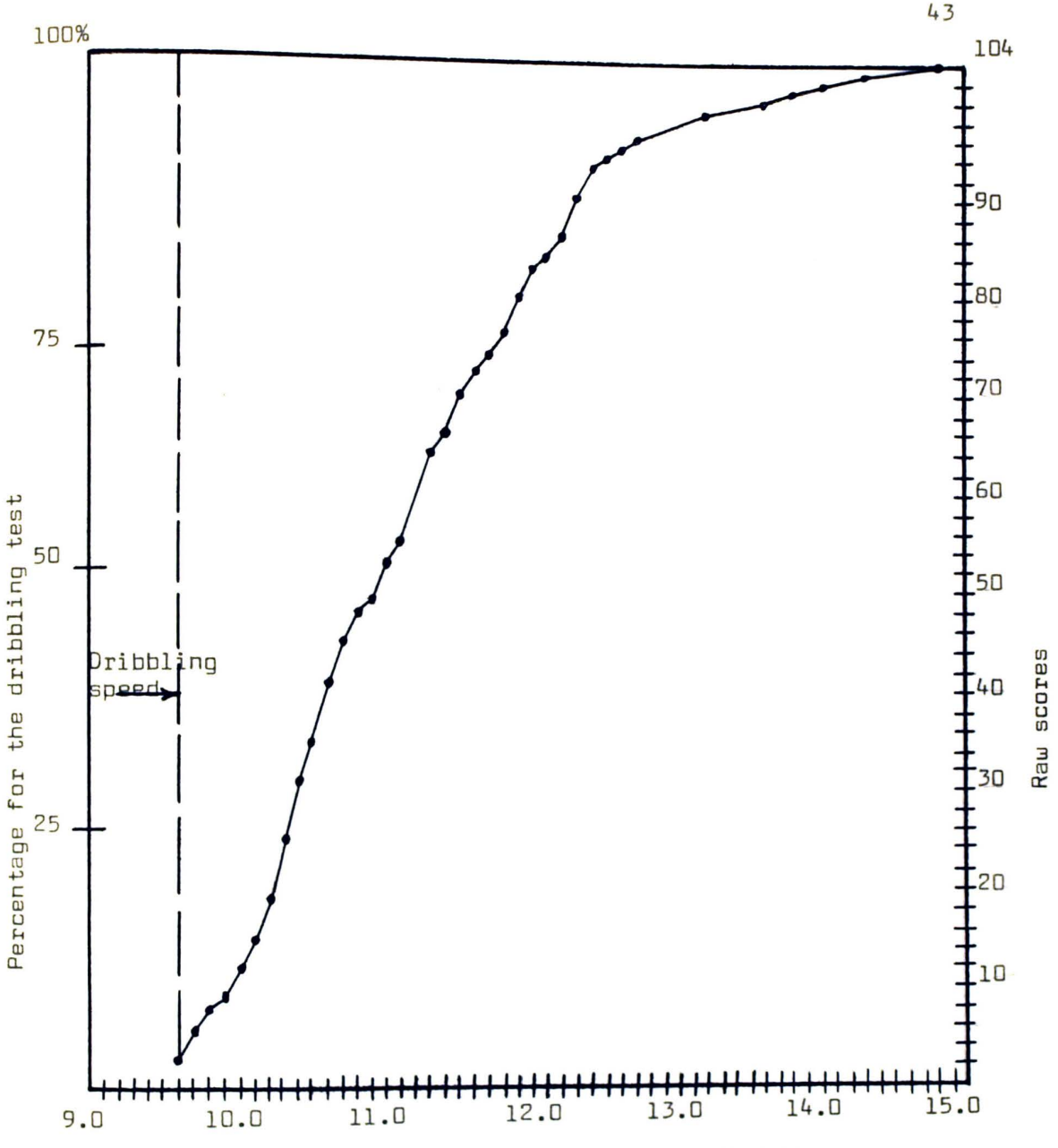


TABLE X

OGIVE CURVE SHOWING PERCENTILE EQUIVALENTS OF THE DRIBBLING TEST

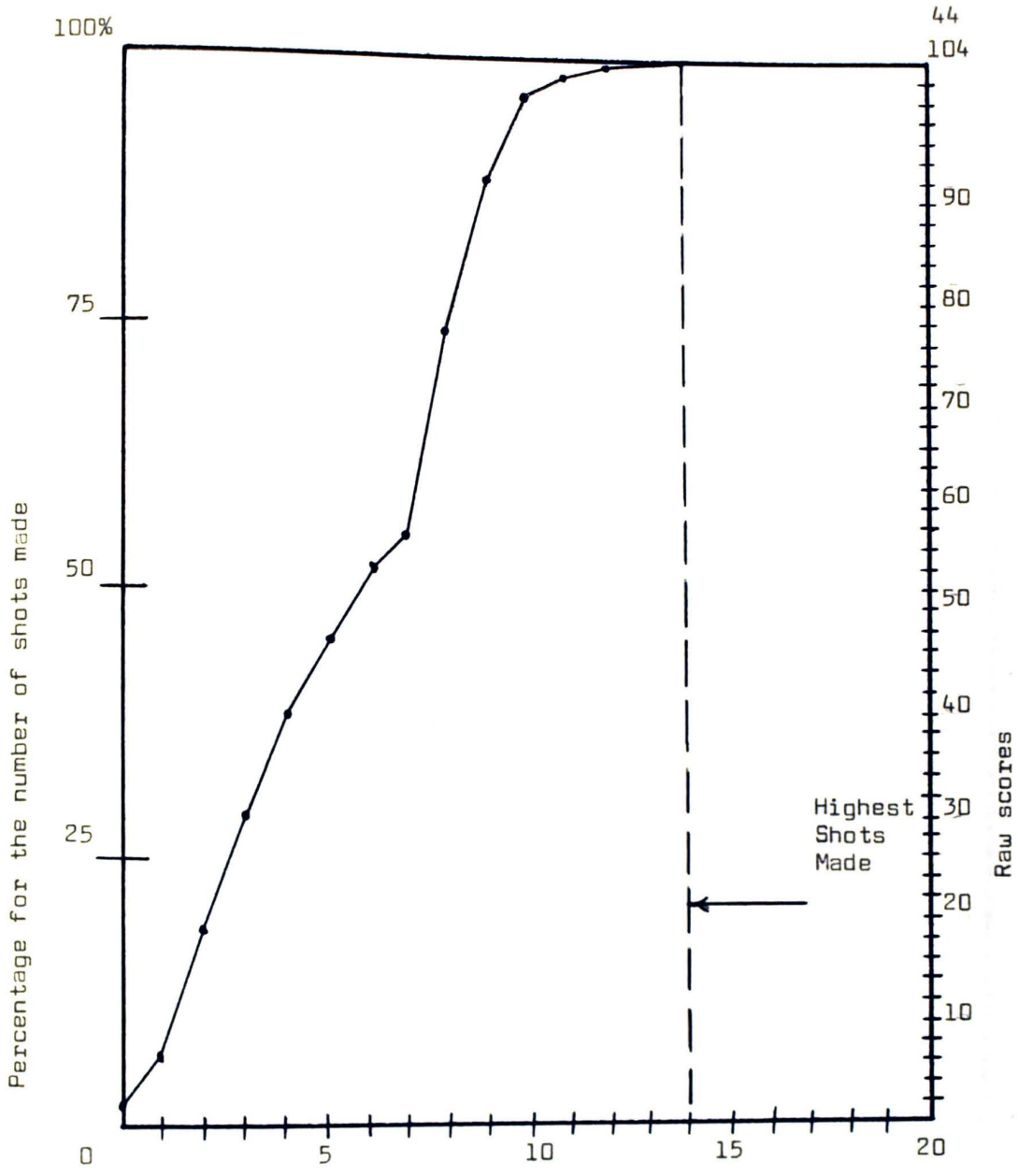


TABLE XI

OGIVE CURVE SHOWING PERCENTILE EQUIVALENTS OF THE SHOOTING TEST

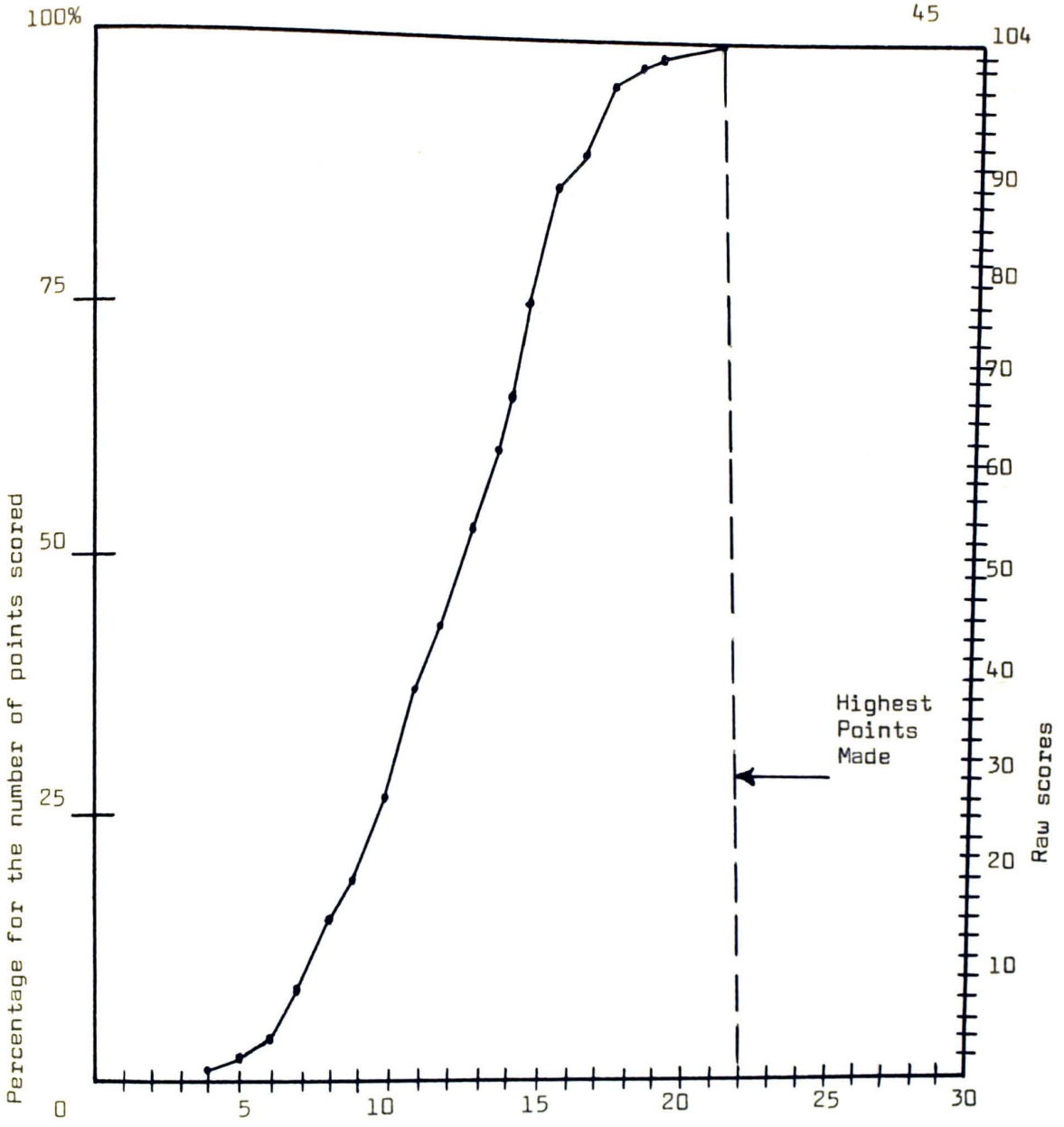


TABLE XII

OGIVE CURVE SHOWING PRECENTILE EQUIVALENTS OF THE THROWING TEST

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BIBLIOGRAPHY

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APPENDIX A.

LIST OF MATHEMATIC SYMBOLS AND FORMULAS USED

M = Mean

Σ = Sum of (Greek capital letter Sigma)

F = Frequency

X = Raw scores

X^2 = Raw scores squared

$\sqrt{\ }$ = Square root

N = Number of cases

σ = Standard deviation

CM= Cumulative frequency

$\sqrt{\frac{FX^2}{N} - \left(\frac{FX}{N}\right)^2}$ = Formula for computing the standard deviation

σ_m = Standard error

$\sigma_m = \frac{\sigma}{\sqrt{N-1}}$ = Formula for computing the standard error

$\not{Z}$ = Z Score or standard score

$\frac{X-M}{\sigma}$ = Formula for computing the $\not{Z}$ score

T score = $\not{Z}$ score expressed either above or below a mean of 50

$10(\not{Z}) + 50$ = T score = formula for computing the T score

TABLE XIII

WORK TOWARD ARRIVING AT
MEAN, STANDARD DEVIATION, AND DEGREE OF ERROR FOR
VERTICAL JUMP TEST

$N=104$

$\Sigma FX=2101$

$\Sigma FX^2=43770$

$$\sqrt{\frac{\Sigma FX^2}{N}-\left(\frac{\Sigma FX}{N}\right)^2}$$

$$\sqrt{\frac{43,770}{104}-\left(\frac{2101}{104}\right)^2}$$

$$\sqrt{420.87-(20.20)^2}$$

$$\sqrt{420.87-408.04}$$

$$\sqrt{12.83}$$

$\sqrt{12.83}=3.58$

$\sigma=3.58$

$$\sigma_m=\frac{\sigma}{\sqrt{N-1}}$$

$$\sigma_m=\frac{3.58}{\sqrt{104-1}}$$

$$\sigma_m=\frac{3.58}{10.15}$$

$\sigma_m=.35$

$\sqrt{3.58}$

$\sigma_m=.35$

TABLE XIV

WORK TOWARD ARRIVING AT MEAN, STANDARD DEVIATION, AND DEGREE OF ERROR FOR RUNNING TEST

$N=104$

$\Sigma FX=946$

$\Sigma FX^2=8,752.42$

$$\sqrt{\frac{\Sigma FX^2}{N}-\left(\frac{\Sigma FX}{N}\right)^2}$$

$$\sqrt{\frac{8,752.42}{104}-\left(\frac{946}{104}\right)^2}$$

$$\sqrt{84.158-(9.096)^2}$$

$$\sqrt{84.158-82.737}$$

$$\sqrt{1.421}$$

$$\sqrt{1.421}=1.1916$$

$$\sigma=1.19$$

$$\sigma_m=\frac{\sigma}{\sqrt{N-1}}$$

$$\sigma_m=\frac{1.19}{\sqrt{104-1}}$$

$$\sigma_m=\frac{1.19}{10.15}$$

$$\sigma_m=.12$$

$\sigma=1.19$ $\sigma_m=.12$

TABLE XV

WORK TOWARD ARRIVING AT MEAN, STANDARD DEVIATION, AND DEGREE OF ERROR FOR DRIBBLING TEST

$N=104$

$\Sigma FX=1144.8$

$\Sigma FX^2=13,124$

$$\sqrt{\frac{\Sigma FX^2}{N}-\left(\frac{\Sigma FX}{N}\right)^2}$$

$$\sqrt{\frac{13,124}{104}-\left(\frac{1144.8}{104}\right)^2}$$

$$\sqrt{126.19-(11.01)^2}$$

$$\sqrt{126.19-121.22}$$

$$\sqrt{4.97}$$

$\sqrt{4.97}=2.23$

$\sigma=2.23$

$$\sigma_m=\frac{\sigma}{\sqrt{N-1}}$$

$$\sigma_m=\frac{2.23}{\sqrt{104-1}}$$

$$\sigma_m=\frac{2.23}{10.15}$$

$\sigma_m=.22$

$\sqrt{4.97}=2.23$

$\sigma_m=.22$

TABLE XVI

WORK TOWARD ARRIVING AT
MEAN, STANDARD DEVIATION, AND DEGREE OF ERROR
FOR THE SHOOTING TEST

$N=104$

$\Sigma FX=654$

$\Sigma FX^2=5450$

$$\sqrt{\frac{\Sigma FX^2}{N}-\left(\frac{\Sigma FX}{N}\right)^2}$$

$$\sqrt{\frac{5450}{104}-\left(\frac{654}{104}\right)^2}$$

$$\sqrt{52.40-(6.28)^2}$$

$$\sqrt{52.40-39.43}$$

$$\sqrt{12.97}$$

$$\sqrt{12.97}=3.60$$

$\sigma = 3.60$

$$\sigma_m=\frac{\sigma}{\sqrt{N-1}}$$

$$\sigma_m=\frac{3.60}{\sqrt{104-1}}$$

$$\sigma_m=\frac{3.60}{10.15}$$

$\sigma_m=.35$

$\sigma=3.60$ $\sigma_m=.35$

TABLE XVII

WORK TOWARD ARRIVING AT
MEAN, STANDARD DEVIATION, AND DEGREE OF ERROR
FOR THE THROWING TEST

$N=104$

$\Sigma FX=1339$

$\Sigma FX^2=19760$

$$\sqrt{\frac{\Sigma FX^2}{N}-\left(\frac{\Sigma FX}{N}\right)^2}$$

$$\sqrt{\frac{19,760}{104}-\left(\frac{1339}{104}\right)^2}$$

$$\sqrt{190-(12.88)^2}$$

$$\sqrt{190-165.89}$$

$$\sqrt{24.11}$$

$$\sqrt{24.11}=4.91$$

$\sigma=4.91$

$$\sigma_m=\frac{\sigma}{\sqrt{N-1}}$$

$$\sigma_m=\frac{4.91}{\sqrt{104-1}}$$

$$\sigma_m=\frac{4.91}{10.15}$$

$\sigma_m=.48$

$\sigma=4.91$ $\qquad$ $\sigma_m=.48$

APPENDIX 8.

TABLE XVIII

RAW SCORES OF THE VERTICAL JUMP RECORDED, X, F, FX, X^2, CF. FX^2

Number of Points Scored X	F	FX	X^2	CF	FX^2
30					
29					
28	2	56	784	104	1568
27	1	27	729	102	729
26	2	52	672	101	1352
25	6	150	625	99	3750
24	9	216	576	93	5185
23	4	92	529	84	2116
22	17	374	484	80	8228
21	11	231	441	63	4851
20	13	260	400	52	5200
19	10	190	361	39	3610
18	7	126	324	29	2268
17	3	51	289	22	867
16	6	96	256	19	1536
15	6	90	225	13	1350
14	1	14	196	7	196
13	4	52	169	6	676
12	2	24	144	2	288
11					
10					
9					
8					
7					
6					
5					
4					
3					
Totals	104	2101			43,770

m=20.20
σ = 3.58
σ_m= .35

TABLE XIX

RAW SCORES OF THE RUNNING TEST RECORDED,
X, F, FX, X^2, CF, FX^2

Number of Points Scored X	F	FX	X^2	CF	FX^2
12.0					
11.9					
11.8					
11.7					
11.6					
11.5	2	23.0	132.25	104	264.50
11.4					
11.3					
11.2					
11.1					
11.0					
10.9	2	21.8	118.81	102	237.62
10.8					
10.7	3	32.1	114.49	100	343.47
10.6					
10.5					
10.4					
10.3					
10.2	1	10.2	104.04	97	104.04
10.1	2	20.2	102.01	96	204.02
10.0	1	10.0	100.00	94	100.00
9.9	1	9.9	98.01	93	98.01
9.8	1	9.8	96.04	92	96.04
9.7	2	19.4	94.09	91	188.18
9.6	2	19.2	92.16	89	184.32
9.5	5	47.5	90.25	87	451.25
9.4	8	75.4	88.36	82	706.88
9.3	6	55.8	86.49	74	518.94
9.2	5	46.0	84.64	68	423.20
9.1	9	81.9	82.81	63	745.29
9.0	7	63.0	81.00	54	567.00
8.9	6	53.4	79.21	47	575.26
8.8	7	61.6	77.44	41	542.08
8.7	5	43.5	75.69	34	378.45
8.6	6	51.6	73.96	29	443.76
8.5	3	25.5	72.25	23	216.75
8.4	10	84.0	70.56	20	700.56
8.3	2	16.6	68.89	10	137.78
8.2					

TABLE XX

RAW SCORES OF THE DRIBBLING TEST RECORDED, X, F, FX, X^2, CF, FX^2

Number of Seconds X	F	FX	X^2	CF	FX^2
15.0					
14.9					
14.8	1	14.8	219.04	104	219.04
14.7					
14.6					
14.5					
14.4					
14.3	1	14.3	204.49	103	204.49
14.2					
14.1					
14.0	1	14.0	196.00	102	196.00
13.9					
13.8	1	13.8	190.44	101	190.44
13.7					
13.6	1	13.6	184.96	100	184.96
13.5					
13.4					
13.3					
13.2	3	39.6	174.24	99	522.72
13.1					
13.0	0				
12.9	0				
12.8	0		163.84		
12.7	1	12.7	161.29	96	161.29
12.6	1	12.6	158.76	95	158.76

TABLE XXI

RAW SCORES OF THE SHOOTING TEST RECORDED, X, F, FX, X^2, CF, FX^2

Number of Shots Made X	F	FX	X^2	CF	FX^2
20					
19					
18					
17					
16					
15					
14	1	14	196	104	196
13	1	13	169	103	169
12	2	24	144	102	288
11	8	88	121	100	968
10	15	30	100	92	1500
9	10	90	81	77	810
8	10	150	64	67	640
7	3	21	49	57	147
6	7	42	36	54	252
5	7	35	25	47	175
4	9	36	16	40	144
3	12	36	9	31	108
2	12	24	4	19	48
1	5	5	1	7	5
0	2	0	0	2	0
Totals	104	654			5450

TABLE XXII

RAW SCORES OF THE THROWING TEST RECORDED, X, F, FX, X^2, CF, FX^2

Number of Points Scored X	F	FX	X^2	CF	FX^2
30					
29					
28					
27					
26					
25					
24					
23					
22	1	22	484	104	484
21	1	21	441	103	441
20	2	40	400	102	800
19	7	133	361	100	2527
18	3	54	324	93	972
17	12	204	289	90	3468
16	10	160	256	78	2560
15	5	75	225	68	1125
14	8	112	196	63	1568
13	10	130	169	55	1690
12	6	72	144	45	864
11	11	88	121	39	1331
10	8	80	100	28	800
9	4	36	81	20	324
8	7	56	64	16	448
7	5	35	49	9	245
6	2	12	36	4	72
5	1	5	25	2	25
4	1	4	16	1	16
3					
2					
1					
0					
Totals	104	1339			19760

$m = 12.88$

$\sigma = 4.91$

$\sigma_m = .48$