AN EXPERIMENTAL INVESTIGATION OF THE PREDICTIVE ABILITY OF A SELECTED BATTERY OF BASKETBALL TESTS AND A METHOD OF MEASURING IMPROVEMENT OF BASKETBALL PLAYING SKILLS

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Master of Arts

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THESIS ABSTRACT

Three related purposes provided the problem for investigation in this study: (1) to demonstrate the use of a validation technique in which game results were used as the criterion, (2) to construct a test for equating teams which is economical and easy to administer, and (3) to measure improvement of basketball playing fundamentals.

In this experiment a nine item test battery was administered to one-hundred and thirteen students enrolled in Recreational Activity Classes at Appalachian State Teachers College. The test battery consisted of the following tests: (1) penny-cup test, (2) speed dribble test, (3) field goal speed test, (4) speed pass test, (5) vertical jump test, (6) side shift test, (7) dash test, (8) accuracy pass test, and (9) accuracy shoot test. The first five items of the test battery were used to predict basketball ability while all nine items were used to measure improvement. All one-hundred and thirteen subjects took the nine item test battery at the beginning and end of the Winter Quarter.

The test scores were recorded in raw scores and then converted to T-scores. Each student's basketball ability score was determined by adding together the T-score value of

the first five test items. Teams were composed of five players whose membership was determined by random selection. The basketball ability scores of five team members were added together giving the total team basketball ability test score. One-hundred games of fifteen minute duration were played between teams having different team test scores. Of the one-hundred games played eighty-two were won by the team having the largest team test score, sixteen were lost, and two were tied. Forty games of the same length were played using each of the five basketball ability tests individually as a basis for determining the single item team test score. Of the forty games played twenty-four were won by the team having the largest team test score, fifteen were lost, and one was tied.

The raw scores made by all subjects on both the first and second administration of the nine item test battery were compared to determine if the students improved their skill. The results of these computations indicated, when averages were considered, improvement was made.

Correlations were made between the test battery scores and the scores of each individual test item. These correlations ranged from a .41 on the vertical jump test to a .69 on the speed pass test. A correlation coefficient of .247 was found to exist between the game scores and the team test scores. A rho correlation was made between the team test score differences and the game score differences and the results of this correlation was .22.

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CHAPTER I

I. INTRODUCTION

From the inventor's peach baskets to the present iron rims, from the small low-ceilinged gymnasiums to the massive field houses of today, from audiences of a few hundred to crowds of twelve to twenty thousand unfolds the unprecedented growth of the sixty-six year old indoor game of basketball. Since 1892 the game of basketball has grown to such great proportion that it is now played by more high school students than any other sports activity.[1]

Psychologists have stated that we are all controlled by certain drives or wishes in whatever we do or want to do. The psychologists often differ as to the number of such drives we possess but they agree that among these are the drives for recognition, response, and new experience which are especially strong in the teen age.[2] The typical teen-ager wants to be admired, seeks a higher position among his associates, wants love, approval, adventure, excitement, and new experiences.

Basketball can be a wholesome means to desirable

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[1] Don Seaton, Irene Clayton, Howard Leibee, Lloyd Messersmith, Basic Book of Sports (New Jersey: Prentice Hall Inc., 1956), p. 1.

[2] C. C. Diettert, "What is Right with Basketball", School Activities, 24:185-187, February, 1953.

satisfaction of these cravings. The boy who has to drive a hot rod at a reckless or high rate of speed to gain excitement from living and recognition which he craves certainly has not been properly challenged. Because it is controlled by school people of high ideals who seek, through guidance, to develop character and personality, basketball serves both participant and spectator in a highly acceptable manner.

In our modern times, with so many allurements for youth, we need something quite captivating as a unifying interest through which both recognition and response can be satisfied. We need to feed and satisfy these desires frequently or youth will find avenues in unwholesome directions. It would be difficult to find other activities that can compare to basketball in providing exciting entertainment that can captivate the minds of students and steer them in worthy directions.

The popularity of basketball emphasizes the importance of and necessity for a well organized physical education program. It is reasonable to assume that without organization the objectives of physical education in general, and of basketball in particular, cannot be attained. The following objectives are a portion of what is desired to be developed in young boys through the physical education activity of basketball:

1. The development of healthy and happy boys.
2. Good citizenship.

3. A sound mind and a sound body.
4. Sportsmanship-how to win humbly and lose graciously.
5. Loyality to self and others.
6. Dependability.
7. Honesty.
8. Respect for authority.
9. Tolerance.
10. Initiative and resourcefulness.
11. Courage.
12. Leadership.
13. Good mental training.
14. Development of skills.
15. Social, personality, and emotional development.

It is difficult to believe that the above mentioned objectives can be developed to their most desirable degree when competition is conducted between those teams possessing a great abundance of player skill and those with far lesser ability. The person who gets to handle and shoot the ball only a few times during a game has little opportunity to develop skill, sportsmanship, and initiative. A simple test for reducing inequality of teams would be useful in the attainment of the above mentioned objectives. Thus it becomes the responsibility of every coach or physical education teacher to conduct each sports activity so that the maximum results can be obtained.

II. THE PROBLEM

Statement of the problem.

Three related purposes provided the problems for investigation in this study. They were: (1) to demonstrate the use of a validation technique for a team sport test in which game results were used as the criterion, (2) to construct a test for equating teams which is economical and easy to administer, and (3) to measure improvement of basketball playing fundamentals.

The writer recognizes the limitations of this study in that only one-hundred and thirteen cases were used and that factors such as age, height, weight, prior experience, desire, courage, and resourcefulness could not be controlled. He also realizes that more than one-hundred and forty games need to be played in order to substantiate all results.

III. IMPORTANCE OF THE STUDY

Two major criticisms of many physical education classes are that there is no progression in activities from one year to the next and no differentiation within the same class with regard to the varying ability of individuals. These practices cannot be justified if physical education is to maintain its rightful place in the education of today's children. A well organized and administered skill test can be a motivating factor for both student and teacher. However,

the most important factor of a testing program is the use of the results obtained from the test. The results of the basketball skill test can be used in the following ways:

1. Classification and Team Membership. Students can be classified on the basis of performance ability as displayed on a basketball test battery. With the use of achievement scales obtained from such tests, large classes can be sub-divided into smaller divisions of comparable basketball ability to facilitate instruction. The composite score of a basketball test battery can be taken as indicative of playing ability and teams of equal ability can be arranged.

2. Teacher Evaluation and Diagnosing Strengths and Weaknesses. From a comparison of the scale scores of two tests the instructor can obtain information concerning each student's ability. A study of a first test might reveal that the student is above average in one skill and below average in others. By a comparison of the results of both tests the instructor might find that the student has not progressed in those skills in which he was below average. By analyzing the progress of the group in general, and particular individuals within the group, a change in method may be indicated which will be of advantage to all concerned. When students fail to show improvement the instructor should immediately analyze his teaching technique to discover, if possible, wherein the techniques may be faulty. Other things being equal, the rate

of progress which students make in the acquisition of skills is a guide to the evaluation of the teaching technique in use.

3. Motivation. Students appreciate a knowledge of their proficiencies and deficiencies and are often not conscious of either until an objective measure is offered them. Practice with attention to particular basketball skills does have a positive effect upon performance, and students are encouraged and enthusiastic when they discover that they have been successful in bettering their previous record.[3] Success means additional effort and practice and motivation continues. When students find they are weak in certain skills they normally will want to improve those deficiencies.

4. Evaluating Student Performance. It can be assumed that the score for any individual who takes a test is a legitimate measure of the performance level attained by that individual. It is not a subjective estimate on the part of the teacher and it does not include such items as attitude, attendance, effort, and conduct. It is strictly an objective measure which can be used by the student in determining his present level of ability in the skills of basketball. Except in rare instances, students are interested in knowing where they stand in relation to the entire group. By proper use of

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[3] Hazel J. Cubberly, "Achievement Scales for College Women", Research Quarterly, 3:113-118, October, 1935.

the test results the student's relative position with reference to the ability of the group can be determined.

IV. DEFINITIONS OF TERMS USED

In order that certain terms which are consistently used in this study can be understood by the reader and have the meaning intended by the writer, these words are defined in the following paragraphs:

1. Individual Test Score. The individual test score represents the total points accumulated on all nine tests by any one person.

2. Basketball Ability Test Score. The basketball ability test score is the total of T-scores for the following five tests: (1) Penny-Cup Test, (2) Speed Dribble Test, (3) Field Goal Speed Test, (4) Speed Pass Test, and (5) Vertical Jump Test.

3. Five Item Team Test Score. The five item team test score is the total of basketball ability test scores for five individuals.

4. Single Item Team Test Score. The single item team test score is the total score for five individuals on one of the basketball ability test items.

CHAPTER II

REVIEW OF THE LITERATURE

The development of tests to evaluate sports skill began as the curriculum in physical education changed from "formal-drill" to "games and sports". By the present standards the first efforts to evaluate basketball skills were fairly crude. Substantial progress has been made in the development of better sports skill tests in the past thirty-three years.[4] There is still much work to be done as basketball skill tests are not yet of a quality to enable a teacher to make strict individual judgements on the basis of scores obtained.[5]

Much has been written in regards to basketball, but only a brief summary of the work done on problems very closely related to the one at hand will be given.

In 1934 Edgren presented a study in the area of predicting basketball ability.[6] He used two groups and administered tests of specific basketball skill, general athletic

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[4] American Association for Health, Physical Education and Recreation, Measurement and Evaluation Materials in Health, Physical Education, and Recreation, A Report Prepared by the National Research Council, (Washington, D. C.: American Association for Health, Physical Education, and Recreation, 1950), p. 67.

[5] Ibid., p. 67.

[6] Harry D. Edgren, "An Experiment in Testing of Ability and Progress in Basketball", Research Quarterly, 3:159-171, March, 1932.

ability, and neuro-muscular coordination. Of the two groups used one was composed of thirty members of varied basketball ability and the other a beginner's class in basketball. The tests were administered to the two groups at the beginning of the quarter, after two weeks of actual play, after two months of instruction, and at the conclusion of the quarter. Edgren found the average per cent of ability of the experimental group increased 20.1 per cent and the control group 4.2 per cent. The coefficient of correlation between the basketball test and actual play was .73 on the pre-test, and .77 on the final test.

Johnson developed a basketball test for high school boys using nineteen tests in the initial experimentation.[7] Each item was checked for reliability and validity and two tests were finally selected; one for evaluation of basketball ability and the other for evaluation of potential ability. The first test contained three items and the latter four items. The validity on the ability test was .88 and on the test of potentiality .84. The reliability of the ability test was .89 and for the potentiality test .93. The items used for the potentiality test were: jump and reach, dodging, and the Iowa Revision of the Brace Test. The items on

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[7] H. Harrison Clarke, Application of Measurements to Health and Physical Education, (New York: Prentice-Hall, Inc., 1950), pp. 305-306.

the ability test were the field goal speed test, basketball throw for accuracy, and a dribble test.

In 1937 Cozen, Cubberly, and Neilson developed a battery of tests to be used for girls and women at the secondary and college level.[8] The directions for the test items were established on an experimental basis and then were revised after practical use. The reliability and validity of the individual items comprising the battery was not reported.

In 1948 a basketball test for men was developed by Lehsten.[9] The factors of speed, shooting, passing, reaction time, sensory motor coordination, footwork, motor ability, and motor agility were used by Lehsten as a criteria for establishing the test. Five judges were used to rate each player according to ability three different times. An eight item test comprised the original battery which was checked against a five item test that was later evolved. The test was established using eighty-six cases and the correlation between the two tests was .97.

Schwartz developed a basketball test to be used with

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[8] F. W. Cozens and others, Achievement Scales in Physical Education Activities for Secondary School Girls and College Women, (New York: A. S. Barnes and Company, 1937), p. 165.

[9] Nelson Lehsten, "A Measure of Basketball Skills for High School Boys", The Physical Educator, 5:103-109, December, 1948.

senior high school girls.[10] The items of the test battery were: bounce over a six foot area, pass and catch, jump and reach, throw for goal, pivot and bounce, and shoot. Expert opinion was used in an attempt to evaluate the test. Achievement scales were established on the sum of scores on four items. The raw scores for each of the four items were converted to T-scores, added together, and divided by four to find a student's score for the test.

Knox developed a basketball test battery composed of a speed dribble, wall bounce, dribble-shoot, and a penny-cup test.[11] The tests were administered to eight high school basketball teams during the second week of basketball practice. The criterion for validating the test was the success players had in making a ten-man high school varsity team. Three divisions of basketball ability, nonplayers, substitutes, and first-team members were compared at the eight schools. The reliability coefficients for the various test items ranged from .58 to .90, while the total battery coefficient was .88. There was 89 per cent agreement between the results of the basketball test and squad membership for tournament play, and 81 per cent agreement with membership on the first team. Knox revealed

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[10] Helen Schwartz, "Achievement Tests in Girls Basketball at the Senior High School Level", Research Quarterly, 8:143-156, March, 1937.

[11] Robert D. Knox, "Basketball Ability Tests", Scholastic Coach, 17:45-48, March, 1947.

that the test is much more effective when administered to experienced or varsity groups.

Stroup administered a battery of basketball ability tests and tests of motion perception to one-hundred and one students enrolled in sports activity classes at Southern State College.[12] The purposes of this study were: (1) to investigate the relationship between the field of motion perception and basketball ability, (2) to construct a basketball skill test battery, and (3) to determine the validity in forcasting efficiency. The test results indicated a biserrial correlation between measurements of the field of motion perception and basketball ability of .765. The test and retest for the entire sample indicated a forcasting efficiency of 41.8 per cent.

Lehsten, in another study, made an effort to establish a practical test for high school boys which would measure their physical aptitude for basketball.[13] An eight item test was administered in three days to selected physical education classes. Five judges were used to administer the test and subjectively rate the players from one to five, using a standardized check sheet. The subjective total point ratings were

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[12]Francis Stroup, "Relationship Between Measurements of Field of Motion Perception and Basketball Ability in College Men", Research Quarterly, 28:72-76, March, 1957.

[13]Nelson Lehsten, "Basketball Aptitude Tests", Scholastic Coach, 19:65-66, October, 1946.

correlated with the eight item battery total and the scores resulted in a .80 relationship.

Boyd, McCachren, and Waglow attempted to determine the predictive ability of a test battery in selecting members of a basketball team.[14] The Knox Basketball Test was administered to forty-two candidates for the University of Florida's junior varsity basketball team. The coach ranked all players according to ability after three weeks of practice, and at the conclusion of the season. The total number of minutes played was divided by games played, and a comparison was made between the total points scored with average minutes played in each game. The facts were that an rho correlation coefficient of .85 was obtained between the coach's ranking of the 18 members retained on the squad at the end of the season and the ranking of the 18 players according to the average minutes played per game.

Voltmer and Watts developed a rating scale in an attempt to determine, by objective ratings, those players who would be most beneficial to a basketball team, and possess the greatest amount of over-all playing ability.[15] They devised a rating scale and subjected all players to the scale during pre-season scrimmages, and varsity and junior varsity interschool basket-

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[14] C. A. Boyd, J. R. McCachren, and I. F. Waglow, "Predictive Ability of a Selected Basketball Test", The Research Quarterly, 26:364-365, October, 1955.

[15] E. F. Voltmer and Ted Watts, "A Rating Scale of Player Performance in Basketball," Journal of Health and Physical Education, 11:94-95, February, 1940.

ball games. The scale was explained to the players prior to the beginning of the season and three judges were used in recording the information contained on the scale. Voltmer and Watts found that the individual scores ranged from a negative 16 to a positive 31 for a single scrimmage, and from a negative 20 to a positive 43.5 for all scrimmages combined. Team scores for the various interschool games ranged from a negative 8.5 to a positive 35.

Young and Moser made a study in an effort to find reliable and valid tests of ability and achievement in physical education activities, particularly in the area of basketball.[16] After careful consideration of all tests measuring basketball ability, Young and Moser selected five tests of relatively higher validity. These tests were administered to ninety-three players of varied basketball ability at the University of California. Three judges independently rated the ability of each player during a game. The results indicated that in seventy out of ninety-three players rated, the judges agreed on their ratings. In twenty-one other cases two of the judges agreed on their ratings. The coefficient of correlation of the total test scores with the ratings on which either two or three judges agreed was .855. The ratings on which all three

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[16] Genevive Young and Helen Moser, "A Short Battery of Tests to Measure Playing Ability in Women's Basketball", The Research Quarterly, 5:3-11, May, 1934.

agreed the coefficient correlation was .859. The coefficient of correlation between tests ranged from .218 to .419.

CHAPTER III

PROCEDURE

Selection of Subjects.

All of the one-hundred and thirteen men tested in this experiment were college freshmen and sophmores of various heights, weights, and body builds. They were enrolled in Recreational Activity Classes at Appalachian State Teachers College. Each of the subjects consented to participate in this experiment and no attempt was made to determine class membership either before or after the course began. The subjects did not participate in any other organized physical education activities during the time given to basketball. Only one participant had not played any basketball prior to enrolling in the basketball activity class. No attempt was made to obtain subjects with any specific level of ability.

Selection of Tests.

In planning the procedures to be followed in the study the writer selected those tests which, in his opinion, are characteristic of basketball. The following criteria for the selection of test items were used:

1. The tests should involve as many basic basketball skills as possible.

2. The tests should allow for some measure of success by all subjects.

3. The test should be economical and easy to administer.

4. The tests should be challenging and meet the individual needs and abilities of both the skilled and unskilled.

Description of Test Items.

A battery of nine items was selected for use in this experiment. These are listed below with a description of each. The tests were designed to measure the various abilities of the student in the fundamentals of basketball. Test items were selected which could be measured objectively and were considered valid measures of the individual skills considered. The five item basketball ability test was used to predict basketball playing ability while all nine items of the test battery was used to measure improvement.

1. Penny-Cup Test. The Penny-Cup Test is a test devised by Knox and was selected for use in this experiment.[17] A twenty foot course was set up with a "signal line" eight feet from the starting line. Three ordinary tin coffee cans with a five inch diameter, painted black, white, and yellow, was placed in a vertical line five feet apart at the finish line. The subject stands behind the starting line with his back to the cups. He has a penny in either hand, and on the command "Ready-Go", he pivots and races towards the cups. As

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[17] Ibid., p. 45.

he crosses the signal line the tester shouts out the color of one of the cups located at the finish line. The subject then dropped the coin into that cup. The watch starts on the signal "Go" and is stopped at the sound of the coin clinking into the can. The test was repeated four times. The total elapsed time for all four repititions represents the score. The subject was allowed to run through the test once for practice. The positions of the cans were changed after each test while the next subject was standing with his back to the finish line. Time was measured to the nearest one-half second.

2. Speed Dribble Test. Even though speed is not always desirable in dribbling, the efficient dribbler is able to dribble with great rapidity. An adaption of the speed dribble test developed by Edgren was selected to test the subject's ability to manipulate the ball around objects.[18] Four chairs were placed in a straight line so that the first chair was twenty feet from the starting line and the remaining three fifteen feet apart. The subject being tested stands behind the starting line with a basketball in his hands. On the signal "Ready-Go", he dribbles in and around the obstacles and then weaves back in like manner. Time was measured to the nearest one-half second, beginning on the signal "Go" and stopping when the subject crossed the finish line. The subject was allowed to dribble with either hand and pass on

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[18] Ibid., p. 161.

either side of the first chair.

3. Field Goal Speed Test. The writer selected an adaption of the field goal speed test constructed by Johnson to measure the subject's ability to make baskets when in a situation that requires rapid retriving of the ball and shooting since the success of a team often depends largely on their ability to do these things well.[19] The subject may assume any position he desires under the basket. On the signal "Ready-Go" he starts taking lay-up shots as fast as he can. At the end of one minute the signal "Stop" is given. One point is scored for each basket made. The subject may shoot with either or both hands and in any manner desired.

4. Speed Pass Test. An adaption of the wall bounce test designed by Knox was selected by the writer to measure the rapidity with which the student can receive and pass a basketball against a wall for thirty seconds.[20] An important skill in basketball is to move the ball with speed and accuracy from player to player in such a way as to keep it from the defense and confuse them so as to permit time and space for scoring. The straight, two-handed chest pass is perhaps the most frequently used. The subject stood with his toes behind a line five feet from the wall. The object of this test was to ascertain how many complete passes can be made by

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[19] Ibid., p. 305.

[20] Ibid., p. 45.

bouncing the ball off the wall in thirty seconds. The subject begins passing the ball on the signal "Ready-Go", and continues for thirty seconds. Each subject will be allowed to pass the ball four times for practice. The ball must be definitely caught, not batted, after each pass. The score for this test is determined by the number of passes completed in the allotted time.

5. Vertical Jump Test. Lehsten used the Vertical Jump Test to measure the strength of high school boys.[21] This test was devised as a means of judging the ability of an individual to lift his body directly upward with a jump and reach. Agility and strength in jumping high into the air are very useful as in held ball jumps which occur after the ball has been simultaneously held by opposing players. In addition a good jumper has value around the baskets, where by jumping higher than the other players, he gains possession of the ball after shots. The subject stands facing the jump-reach chart. While keeping both feet flat on the floor the subject reaches up as high as possible and makes, with a piece of chalk, a horizontal mark on the wall. He then turns ninety degrees to the left or right so that the hand he desires to use for reaching is closest to the wall. Then he crouches and jumps and, at the point of greatest height, makes a second horizontal mark at the highest point of reach. The subject may use any type

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[21] Ibid., p. 106.

of arm swing desired preliminary to the jump. Subjects are allowed two trials. The best jump is selected and the score is represented by the vertical distance between the reach mark and the jump-reach mark, measured to the nearest one-half inch.

6. Side Shift Test. This test was devised as a means of judging the ability of an individual to shift his body from left to right and from right to left similar to the way a basketball player does when guarding an opponent. The key to all good defense is careful guarding against all scoring attempts of the opponents. A good guarding position requires a semi-crouched, balanced stance, and readiness to move in any direction. The boxer's glide or sidestep is most usually used to prevent cross-stepping and unbalanced movement. The subject must work with his feet spread in a good position and shift his body across a twelve foot lane. The subject works inside the lane and needs only to touch the line with the outside foot on each shift. On the signal "Ready-Go", the subject shifts from left to right and from right to left across the twelve foot lane. The subject is awarded one point for every shift completed across the lane in thirty seconds.

7. Dash Test. The dash test was used to determine the speed with which the subject could travel a given distance when forced to run. Basketball requires not only great running endurance, but also unusual quickness in starting and stopping and in altering direction. The subject being tested

may assume any position desired at the starting line. On the command "Ready-Go" he sprints as fast as possible towards the finish line. At the finish line the subject assumes a running position with his back to the starting line. On the command "Ready-Go", he runs backwards to the starting line as fast as possible. The total time elapsed for the forward and backward run over the seventy-five foot course represents the score. Time was measured to the nearest one-half second.

8. Accuracy Shooting Test. The accuracy shooting test was devised to measure the distance and direction judgement of an individual when shooting from selected places on the court. Accurate, consistent shooting from all parts of the offensive court is an important phase of successful basketball. In this test the subject attempted five shots from each of the three points designated on the court. The first point was located twelve feet from the end of the court along the right side of the free throw lane, and twelve feet to the right of this point as you face the end of the court. The second point was the center of the free throw line. The third point was located twelve feet from the end of the basketball court along the left side of the free throw lane, and twelve feet to the left of this point as you face the end of the court. The subject was instructed to stand behind each line and shoot five shots using any type of shot desired. He was awarded one point for each basket made.

9. Accuracy Pass Test. This test was devised to

measure the accuracy of the subject in using three different types of passes: the bounce pass, the one-hand baseball pass, and the two-hand chest-push pass. The subject stands behind a line drawn parallel to, and twenty feet from, a target designed on the wall. The individual being tested stands behind the twenty foot restraining line and attempts to pass a basketball into the center rectangle of three rectangles diagramed, one inside the other, on the wall. Five passes were made using each of the three types of passes. The center rectangle is twenty-seven inches long and thirteen inches wide. For every pass that hit inside the center rectangle the subject received three points. The middle rectangle was forty-two inches long and twenty-eight inches wide and for every pass that hit inside this rectangle the subject received two points. The outside rectangle was fifty-three inches long and forty-two inches wide and for every pass that hit inside this rectangle the subject received one point. No points were awarded for passes that hit outside the chart. The grade for this test was determined by the total points accumulated using all three types of passes.

Setting Up The Test.

During the periods preceeding the time the tests were to be given, the writer measured and marked with two inch white tape the dimensions of those items that were to be given on that particular day. The items were so arranged as to allow the subjects adequate room to take all tests.

First Administration of Tests.

Before the tests could be administered assistants had to be secured. In order that all nine test items could be administered in two class periods it was necessary to obtain four qualified assistants. The assistants who helped to conduct the first administration were members of a graduate class in advanced tests and measurements. For the second administration four assistants were used who had previously played either college or high school basketball. These assistants were secured well in advance and each knew his specific responsibilities.

Before the tests were administered all the subjects to be tested were oriented to the purpose of this experiment, and verbally pledged their cooperation. During the orientation each test item was explained in detail and the students were requested to ask questions about anything that needed clarification. At the beginning of the period during which the test was administered, all the men were lined-up on one side of the gymnasium. A check was made to see that all were present, including the assistants. The writer then read to the students the general directions and informed them that the specific directions for each item were located at each testing station and should be read before the test was taken. The men then followed the writer through the course of the tests to enable them to know exactly where to go. The Individual Basketball Test Score Sheets were distributed and each

subject was instructed to go to a specific station. A final check was made to see that all assistants were ready and all pieces of equipment were in place and in good working condition. The men were instructed not to shout words of encouragement to the ones taking the tests. The testing then began. The field goal speed, penny-cup, speed dribble, vertical jump, and accuracy pass tests were administered during the first class testing period. The speed pass, dash, accuracy shoot, and side shift tests were administered during the second class meeting.

Teaching Methods.

Due to the length of time required to complete the experiment the whole-game method of instruction was used. One-hundred games of fifteen minutes duration were played between teams with different total team test scores. Forty games of fifteen minutes duration were played using each of the basketball ability tests individually as a basis for determining team membership. Team membership for all games was determined by random selection. The name of each student was written on a small piece of paper and placed in an envelope which indicated the time and number of each class. Each day prior to class time the writer drew from the envelope the names of each player in the class. These names were recorded on a plain piece of white paper and taken to class. Attendance for each class meeting was taken by calling out the names contained on the sheet of paper. The names of those that were absent were

checked off the list. The first five names of those students present composed the first team, the second five the second team, and so on until all members present were placed on a team. Each member present played in at least one game every class meeting. Those players whose names appeared on the first part of the list, which was determined by random selection, often had to play two games in one class meeting. The number of students required to play two games in a period was largely determined by the number of students absent. Four fifteen minute games were played during each class period. Two basketball courts which were adjacent to each other were used for playing all games. Two students were used to officiate each game and one student was used to keep score. The officiating and score keeping duties were rotated so that each player had an opportunity to develop some skill in these areas. The game scores and test scores were recorded immediately following each game.

Second Administration of Tests.

The second test was administered in the same manner as the first, except that different assistants were used. Adequate instructions were given and the same order of performance was used.

CHAPTER IV

ANALYSIS OF DATA

To obtain the predictive ability of the basketball ability test one-hundred games of fifteen minute duration were played using the ability test scores as a basis for determining the five item test score. Of the one-hundred games played eighty-two were won by the team having the largest team test score, sixteen were lost, and two were tied.

Forty games were played in an attempt to validate each item of the basketball ability test battery. Eight games were played using each of the five basketball ability test scores individually to determine the single item team test scores. Of the forty games played, twenty-four were won by the team having the largest team test score, fifteen were lost, and one was tied.

Correlations were made between the test battery scores and the scores of each individual test item. These correlations ranged from a .41 on the vertical jump test to a .69 on the speed pass test. Further results of this correlation can be found in Table I, page 29.

The raw scores made by all subjects on both the first and second administration of the nine item test battery were compared to determine if the students improved their skills. To find the total class improvement the scores made on each

item by all subjects were totaled on the first administration and subtracted from the total scores made by all subjects on the same item of the second administration. The mean individual improvement was determined by dividing the number of subjects tested into the total class improvement. The results of these computations, shown in Table II, page 29, indicates when averages were considered, improvement was made.

A correlation coefficient of .247 was found to exist between the game scores and team test scores of the one-hundred games of fifteen minute duration played using tests one through five as the basis for determining the five item test score. A rho correlation was made between the team test score differences and game score differences of the one-hundred games played using tests one through five as the basis for determining the five item test score. The results of this correlation was .22.

TABLE I

CORRELATION DATA OF TEST BATTERY SCORES WITH INDIVIDUAL TEST ITEM SCORES

TEST	RANGE	MEAN	STANDARD DEVIATION	STANDARD ERROR OF MEAN	CORRE-LATION	ERROR OF CORRELATION
Penny-Cup	51	10.4	0.99	0.09	.45	.059
Speed Dribble	58	14.9	1.66	1.41	.50	.222
Field Goal	47	20.7	6.40	0.60	.58	.061
Speed Pass	51	42.2	5.69	1.53	.69	.049
Vertical Jump	45	18.6	2.63	0.25	.41	.078
Side Shift	46	21.1	2.37	0.22	.60	.061
Dash	44	10.6	0.77	0.07	.58	.063
Accuracy Shoot	53	33.5	1.86	0.17	.58	.063
Accuracy Pass	60	34.2	3.48	0.33	.53	.072

TABLE II

TOTAL CLASS AND INDIVIDUAL IMPROVEMENT IN RAW SCORES

TEST	TOTAL CLASS IMPROVEMENT	MEAN INDIVIDUAL IMPROVEMENT	LARGEST INDIVIDUAL IMPROVEMENT	LARGEST DECREASE IN PERFORMANCE
Penny-Cup	128.0	-1.140	2.5	2.0
Speed Dribble	91.5	-0.817	3.5	2.0
Field Goal	373.0	3.320	15.0	10.0
Speed Pass	330.0	2.940	10.0	7.0
Vertical Jump	158.5	1.410	4.5	4.0
Side Shift	68.0	0.602	10.0	2.0
Dash	79.0	-0.705	3.0	1.5
Accuracy Shoot	67.0	0.598	5.0	5.0
Accuracy Pass	156.0	1.390	13.0	8.0

CHAPTER V

SUMMARY AND CONCLUSIONS

SUMMARY

A survey of the history and development of basketball has brought forth evidence that basketball is becoming increasingly popular and is being recognized more and more by educators as an activity that deserves to be included in the curriculum of schools and colleges. Many attempts have been made to scientifically predict basketball playing ability. Tests of specific basketball skill, neuro-muscular coordination, motor agility, and motion perception have been administered to boys and girls in an attempt to determine basketball playing ability. Some test administrators even used judges and check sheets to measure player performance. Several of the test batteries maintained a high per cent of validity and realibility, but none of the test batteries were completely accurate in predicting game results and player performance.

Three related purposes provided the problem for investigation in this study: (1) to demonstrate the use of a validation technique in which game results were used as the criterion, (2) to construct a test for equating teams which is economical and easy to administer, and (3) to measure improvement of basketball playing fundamentals. The writer

recognizes the limitations of this study in that only one-hundred and thirteen cases were used and that factors such as age, height, weight, and prior experience could not be controlled.

In this experiment a nine item test battery was administered to one-hundred and thirteen students enrolled in Recreational Activity Classes at Appalachian State Teachers College. The test battery consisted of the following tests: (1) penny-cup test, (2) speed dribble test, (3) field goal speed test, (4) speed pass test, (5) vertical jump test, (6) side shift test, (7) dash test, (8) accuracy pass test, and (9) accuracy shoot test. The first five items of the test battery was used to predict basketball ability while all nine items were used to measure improvement. All one-hundred and thirteen subjects took the nine item test battery at the beginning and end of the Winter Quarter.

The test scores were recorded in raw scores and then converted to T-scores. Each student's basketball ability score was determined by adding together the T-score value of the first five test items. Teams were composed of five players whose membership was determined by random selection. The basketball ability scores of team members were added together giving the total team basketball ability test score. One-hundred games of fifteen minute duration were played between teams having different team test scores. Of the one-hundred games played eighty-two were won by the team having the

largest team test score, sixteen were lost, and two were tied. Forty games of the same length were played using each of the five basketball ability tests individually as a basis for determining the single item team test score. Of the forty games played twenty-four were won by the team having the largest team test score, fifteen were lost, and one was tied.

The raw scores made by all subjects on both the first and second administration of the nine item test battery were compared to determine if the students improved their skill. The results of these computations indicated, when averages were considered, improvement was made.

Correlations were made between the test battery scores and the scores of each individual test item. These correlations ranged from a .41 on the vertical jump test to a .69 on the speed pass test. A correlation coefficient of .247 was found to exist between the game scores and the team test scores of the one-hundred games played. A rho correlation was made between the team test score differences and the game score differences of the one-hundred games played. The results of this correlation was .22.

The most important factor of a testing program is the use of the results obtained from the test. The results of this experiment can be used in the following ways: (1) classification and team membership, (2) teacher evaluation and diagnosing strengths and weaknesses, (3) motivation, and (4) evaluating student performance.

CONCLUSIONS

As a result of the survey of the literature available and analysis of data obtained, it may be concluded that: (1) more research is needed, especially in the area of predicting and measuring ability, (2) while this test fails to measure all factors that determine player performance, and is not recommended for use in predicting game scores or game score differences, it has a positive value for predicting game winners, (3) the procedures used in this study illustrates the use of fifteen-minute game results as a criterion for determining the ability of basketball teams, (4) basketball ability scores derived from the five-item basketball ability test are a valid measure of team strength in basketball as indicated by the relationship of the ability scores of competing teams and the ability to win fifteen minute games, (5) performance in the fundamentals of basketball is improved when students have the opportunity to participate in games, and (6) the five item basketball ability test can be administered to forty subjects in one fifty minute period and all nine test items can be administered to the same group in two fifty minute periods.

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APPENDIX

APPENDIX

APPENDIX

Directions for Examiners.

1. Walk through or explain what is to be done on each test you are responsible for. Do not allow trials except on those tests which trials are allowed. Give all students the opportunity to ask questions.

2. Read directions carefully and be able to interpret them to the subjects being tested.

3. Take all time in seconds and one-half seconds. Read the watch carefully.

4. Check equipment frequently to make sure it is in proper working condition.

5. Encourage all students to perform to their best ability.

6. Do not shout words of encouragement at the students after they have started the test.

7. Be sure each student has the proper equipment necessary for successful completion of each test.

8. Be sure each student has the opportunity and sufficient time to read the test directions prior to taking the test.

Directions to be Given to Students.

Give verbatim the following directions for conducting the test to insure best results.

1. This is a test battery constructed to measure your

present basketball playing ability. It is based on the fundamentals of shooting, catching, running, dribbling, jumping, and other basketball skills.

2. The tests which you are about to take will in no way have any bearing on your final grade in this course. Please do the best you can on all tests. The length of time needed to complete all tests will be two class periods.

3. After completing all the tests given on any particular day you are free to go. Please turn in your individual test score sheet.

4. Instructions will be provided for each test at the station the test is being given. Read the directions carefully before taking each test. If you have any questions after reading the instructions, consult the test instructor.

5. Go to any station you desire. Try to keep the lines at each station equalized.

Specific Test Instructions.

1. Penny-Cup Test. The individual being tested will stand with his back to the starting line. He will have in either hand a penny. On the command "Ready-Go" he will turn around and run towards the opposite end of the course as fast as possible. When he reaches the signal line, the instructor will shout the color of one of the cans placed at the finish line. The student will drop the coin in the can the instructor indicated as he crossed the signal-line. Each person will be allowed one practice run. The coin must be placed in the

correct can. The position of the cans will be changed after each student has completed the test. The grade for this test is determined by the length of time, measured to the nearest one-half second, it takes to run through the course four times. If after reading these instructions, you do not completely understand what you are suppose to do, please consult the test instructor.

2. Speed Dribble Test. The individual being tested will stand behind the starting line with a basketball in his hands. On the command "Ready-Go" he will dribble in and around the four chairs located on the course. The grade for this test is determined by the length of time taken to complete the course. Time will be measured to the nearest one-half second. If after reading these instructions you do not completely understand what you are suppose to do, please consult the test instructor.

3. Field Goal Speed Test. The individual being tested will have in his possession a basketball and will stand anywhere on the court, probably close to the basket. On the command "Ready-Go" he will attempt to make as many baskets as possible in one minute. The grade on this test is determined by the number of baskets made in the alloted one minute. If after reading these instructions you do not completely understand what you are suppose to do, please consult the test instructor.

4. Speed Pass Test. The individual being tested will

stand behind a five foot restraining line, facing the wall, with a basketball in his possession. On the command "Ready-Go" he will complete as many passes as possible in thirty seconds by bouncing the basketball against the wall. The ball must be definitely caught after each pass. The grade for this test is determined by the number of passes completed in the alloted time. If after reading these instructions you do not completely understand what you are suppose to do, please consult the test instructor.

5. Vertical Jump Test. The individual being tested will stand facing the wall. With his feet flat on the floor he will reach and make a horizontal mark at the highest point possible on the wall. Next make a ninety degree turn, either right or left. Then jump and reach as high as possible and make a second horizontal mark on the wall. Do this twice. The grade for this test is determined by the length in inches, measured to the nearest one-half inch, between the standing reach mark and the highest jump-reach mark. If after reading these instructions you do not completely understand what you are suppose to do, please consult the test instructor.

6. Side Shift Test. The individual being tested will stand on the inside of a twelve foot lane with his outside foot touching one of the lines. On the command "Ready-Go" he will shift from right to left and from left to right across the lane for thirty seconds. Do not cross legs while shifting. The grade for this test is determined by the number of complete

shifts made across the twelve foot land in the allotted time. If after reading these instructions you do not completely understand what you are suppose to do, please consult the test instructor.

7. Dash Test. The individual being tested will sprint twenty-five yards both forwards and backwards. You will run the course forwards first and then return running backwards. The time will stop after completion of the forward sprint so as to allow ample opportunity to prepare for the backward run. The grade for this test is determined by the length of time, measured to the nearest one-half second, to run the course both ways. If after reading these instructions you do not completely understand what you are suppose to do, please consult the test instructor.

8. Accuracy Shooting Test. Each individual will attempt five shots from each of the three spots designated on the court. The grade for this test is determined by the total number of baskets made out of the fifteen attempted shots. If after reading these instructions you do not completely understand what you are suppose to do, please consult the test instructor.

9. Accuracy Pass Test. The individual being tested will stand behind a twenty foot line and attempt to pass a basketball into the center rectangle of the three rectangles diagramed on the wall. Five attempts will be made with each of three types of passes; the chest push pass, the one hand

baseball pass, and the bounce pass. The ball may be passed at any speed. The grade on this test is determined by the total points accumulated using all three types of passes. If after reading these instructions you do not completely understand what you are suppose to do, please consult the test instructor.

Assistants Needed.

Five test instructors are needed if the test battery is to be completed within two class periods. Each assistant should be skilled in the area of basketball and have some knowledge of tests and measurements. They should also know how to accurately operate and read a stop watch. Two assistant instructors are needed. One to rotate the position of the cans and return the coins during the Penny-Cup Test, and the other to start the pupils on the return backward run of the Dash Test.

Equipment Needed.

1. Four basketballs.
2. Four folding chairs.
3. Five clip boards.
4. Five pencils.
5. Four whistles.
6. Four stop watches that will measure time to the one-half second.
7. One tape measure.

8. One ladder.

9. Two yard sticks.

10. One roll of two inch tape.

11. One dampened cloth.

12. Three cans with a five inch diameter.

13. Five pennies.

Suggestions for Setting Up the Course.

1. In order to gain maximum use of a six-basket gymnasium it is suggested that the penny-cup, field goal speed, speed dribble, vertical jump, and accuracy pass tests be administered during the first class testing period, and the speed pass, dash, accuracy shoot, and side shift tests be administered during the second class testing period.

2. Arrange each test site within the gymnasium at a maximum distance from each other.

3. Use two inch white tape to designate all floor markings. It can be removed easily without leaving undesirable markings on the court.

4. Allow a minimum of thirty minutes to set up the test prior to each class testing period. Check and recheck all dimensions.

5. Have each of the four chairs used in the Speed Dribble Test facing the same direction.

6. Place all equipment necessary in performing the test and recording its results at each station.

7. Inspect all equipment for efficiency and safety

before using.

8. If possible, do not use class members as test instructors or assistant test instructors.

9. Make possible, by the use of signs or other means, the exact location of each test.

10. During the testing program request that noise be kept at a minimum.

11. Check each station while the test is being conducted to make sure it is being recorded and performed correctly.

12. Check each Individual Test Score Sheet when it is turned in to make sure all tests have been taken and recorded properly.

Suggestions for Conducting Games.

1. Make sure the same persons do not have the officiating or scoring responsibilities too frequently.

2. Orient all scorers, officials, and players to the rules of playing and method of scoring.

3. Make sure each player, official, and scorer has the proper equipment to conduct his responsibilities safely and efficiently.

TABLE III

FREQUENCY DISTRIBUTION DATA

PENNY-CUP TEST

RAW SCORE	T-SCORE	FREQUENCY FIRST ADMINISTRATION	FREQUENCY SECOND ADMINISTRATION
7.5	79	3	3
8.0	74	7	10
8.5	69	2	23
9.0	64	14	34
9.5	59	19	22
10.0	54	28	16
10.5	49	22	2
11.0	44	10	1
11.5	39	5	1
12.0	34	2	0
12.5	28	1	0

SPEED DRIBBLE TEST

RAW SCORE	T-SCORE	FREQUENCY FIRST ADMINISTRATION	FREQUENCY SECOND ADMINISTRATION
9.5	80	0	2
10.0	77	3	3
10.5	74	5	8
11.0	71	8	17
11.5	68	13	14
12.0	65	24	27
12.5	62	8	6
13.0	59	10	17
13.5	56	10	3
14.0	53	14	12
14.5	50	5	1
15.0	47	8	2
15.5	44	0	0
16.0	41	0	0
16.5	38	2	0
17.0	35	1	0
17.5	32	0	0
18.0	29	1	0
18.5	26	0	0
19.0	22	0	0
19.5	19	1	0

TABLE IV

FREQUENCY DISTRIBUTION DATA

FIELD GOAL SPEED TEST

RAW SCORE	T-SCORE	FREQUENCY FIRST ADMINISTRATION	FREQUENCY SECOND ADMINISTRATION
38-39	77.5	0	1
36-37	74.5	1	2
34-35	71.5	1	2
32-33	68.5	7	11
30-31	65.0	3	6
28-29	62.0	5	16
26-27	59.0	9	14
24-25	56.0	11	11
22-23	53.0	8	8
20-21	49.5	16	11
18-19	46.5	20	11
16-17	43.5	8	6
14-15	40.5	10	6
12-13	37.0	5	4
10-11	34.0	5	1
8-9	31.0	3	0
6-7	28.0	1	0
4-5	25.0	0	2

SPEED PASS TEST

RAW SCORE	T-SCORE	FREQUENCY FIRST ADMINISTRATION	FREQUENCY SECOND ADMINISTRATION
57-58	77	1	2
55-56	73	1	2
53-54	70	2	4
51-52	66	3	7
49-50	63	4	12
47-48	59	14	19
45-46	56	17	17
43-44	52	14	15
41-42	49	15	13
39-40	45	15	7
37-38	42	11	9
35-36	38	5	3
33-34	35	2	1
31-32	31	1	1
29-30	28	1	0
27-28	24	1	0

TABLE V

FREQUENCY DISTRIBUTION DATA

VERTICAL JUMP TEST

RAW SCORE	T-SCORE	FREQUENCY FIRST ADMINISTRATION	FREQUENCY SECOND ADMINISTRATION
26-26.5	78	0	1
25-25.5	75	0	1
24-24.5	71	3	8
23-23.5	68	8	9
22-22.5	64	9	13
21-21.5	60	8	13
20-20.5	56	14	10
19-19.5	52	17	21
18-18.5	49	20	17
17-17.5	45	12	6
16-16.5	41	9	6
15-15.5	37	7	2
14-14.5	33	4	4
13-13.5	30	0	1
12-12.5	26	2	0

SIDE SHIFT TEST

RAW SCORE	T-SCORE	FREQUENCY FIRST ADMINISTRATION	FREQUENCY SECOND ADMINISTRATION
28	79	1	0
28	75	0	2
26	71	3	9
25	66	5	7
24	62	12	15
23	58	12	19
22	54	13	22
21	49	17	14
20	45	21	19
19	41	13	3
18	37	9	1
17	33	7	0
16	29	0	1
15	25	0	0
14	21	0	0

TABLE VI

FREQUENCY DISTRIBUTION DATA

DASH TEST

RAW SCORE	T-SCORE	FREQUENCY FIRST ADMINISTRATION	FREQUENCY SECOND ADMINISTRATION
8.0	81	0	1
8.5	76	1	9
9.0	71	12	30
9.5	65	31	36
10.0	58	20	22
10.5	52	24	10
11.0	45	16	2
11.5	39	7	2
12.0	32	2	0

ACCURACY SHOOT TEST

RAW SCORE	T-SCORE	FREQUENCY FIRST ADMINISTRATION	FREQUENCY SECOND ADMINISTRATION
9	80	1	3
8	75	0	6
7	70	6	9
6	64	8	8
5	58	15	11
4	54	19	24
3	48	25	18
2	43	20	21
1	37	14	7
0	32	5	5

TABLE VII

FREQUENCY DISTRIBUTION DATA

ACCURACY PASS TEST

RAW SCORE	T-SCORE	FREQUENCY FIRST ADMINISTRATION	FREQUENCY SECOND ADMINISTRATION
43-44	76.5	2	3
41-42	70.5	0	7
39-40	65.5	8	18
37-38	59.5	20	18
35-36	53.5	25	20
33-34	47.5	26	23
31-32	42.5	16	12
29-30	36.5	10	7
27-28	30.5	4	1
25-26	24.5	1	2
23-24	19.5	1	1

TABLE VIII

T-SCORES OF FIRST ADMINISTRATION

KEY

Test 1 - Penny-Cup
Test 2 - Speed Dribble
Test 3 - Field Goal Speed
Test 4 - Speed Pass
Test 5 - Vertical Jump
Test 6 - Side Shift
Test 7 - Dash
Test 8 - Accuracy Shoot
Test 9 - Accuracy Pass

CASES	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	TEST 6	TEST 7	TEST 8	TEST 9	TOTAL 1-9	TOTAL 1-5
1	64	53	36	51	67	58	58	32	52	471	271
2	39	47	50	32	48	45	45	37	46	389	216
3	59	59	72	57	70	45	65	48	64	539	317
4	54	53	38	55	40	58	71	48	44	461	240
5	79	53	61	50	70	45	58	64	49	529	313
6	64	65	38	53	55	37	58	37	41	448	275
7	69	65	32	46	40	49	65	48	32	446	252
8	74	65	49	62	53	37	39	43	44	466	303
9	59	65	41	48	53	33	71	53	61	484	266
10	59	53	47	50	55	62	58	37	55	476	264
11	44	65	61	67	53	49	65	53	58	515	290
12	69	69	52	55	55	66	65	53	49	532	299
13	64	59	54	48	53	49	58	59	52	496	278
14	59	53	46	46	36	37	65	48	44	434	240
15	64	65	50	51	67	58	52	53	41	501	297
16	54	38	35	41	32	41	45	48	38	372	200
17	44	68	47	55	44	33	45	70	44	450	258
18	64	56	46	51	70	49	52	48	55	491	287
19	39	47	40	39	36	33	45	48	29	356	201
20	49	56	41	48	42	45	58	64	55	458	236
21	49	71	60	60	53	49	65	48	55	510	292
22	49	65	44	60	36	45	39	43	46	427	254
23	64	59	49	41	51	45	45	70	49	473	264
24	64	68	50	53	63	49	71	32	41	491	298
25	74	65	40	50	63	62	65	43	55	517	292
26	79	56	47	58	48	33	58	70	52	501	288
27	74	47	35	48	55	41	52	43	55	450	259
28	54	56	55	46	44	41	45	48	44	433	255
29	64	56	32	46	51	58	39	43	46	435	249
30	79	71	68	76	57	79	71	53	61	615	351
31	59	59	66	55	44	45	71	48	52	499	283
32	74	47	43	32	44	41	45	43	64	433	240

TABLE VIII (continued)

T-SCORES OF FIRST ADMINISTRATION

CASES	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	TEST 6	TEST 7	TEST 8	TEST 9	TOTAL 1-9	TOTAL 1-5
33	54	62	38	58	48	58	32	64	38	452	270
34	44	53	68	39	40	45	45	48	49	431	244
35	54	62	49	53	36	49	65	48	61	477	254
36	59	53	46	46	51	41	52	43	52	443	255
37	64	53	40	55	59	54	52	43	58	478	301
38	49	65	47	44	42	33	39	37	44	400	246
39	74	77	46	58	48	54	71	53	46	527	303
40	39	38	36	41	42	37	39	43	58	373	196
41	49	53	58	44	50	58	65	37	46	460	254
42	59	65	50	48	48	54	65	53	49	491	270
43	74	74	57	46	65	76	62	80	58	592	316
44	74	77	63	74	63	71	71	53	46	592	351
45	54	50	50	32	36	37	52	64	49	424	222
46	64	50	46	57	53	45	52	70	46	483	270
47	64	56	46	55	67	62	65	48	41	504	288
48	49	53	58	50	51	54	58	37	18	370	261
49	49	68	46	46	59	66	65	53	58	510	268
50	54	65	54	69	44	58	71	48	52	515	286
51	54	19	33	27	38	33	39	48	38	329	171
52	54	62	47	51	51	41	58	48	44	456	265
53	34	50	44	32	36	37	45	43	55	376	196
54	74	54	40	60	50	62	71	53	58	522	278
55	54	56	40	41	51	45	71	59	44	461	242
56	59	68	47	44	55	41	65	59	52	490	273
57	49	71	63	58	46	45	52	59	55	498	287
58	59	53	44	44	65	58	71	37	41	472	265
59	49	29	27	23	44	45	52	37	23	329	172
60	59	71	50	57	46	66	65	70	55	539	283
61	59	68	57	46	63	54	65	64	64	540	293
62	64	65	40	58	48	62	52	32	46	467	275
63	62	54	49	51	44	45	45	53	35	438	260
64	49	59	55	55	48	58	32	46	58	460	266
65	49	56	44	41	53	37	52	48	49	429	246
66	47	39	55	30	48	49	45	53	35	401	219
67	39	65	61	50	50	49	52	64	61	491	265
68	49	47	40	30	34	45	39	48	46	378	200
69	49	65	68	51	53	41	45	43	61	476	286
70	59	65	58	55	54	65	43	61	53	513	289
71	49	68	52	55	59	45	65	43	46	482	283
72	44	47	43	30	42	37	52	37	52	384	206

TABLE VIII (continued)

T-SCORES OF FIRST ADMINISTRATION

CASES	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	TEST 6	TEST 7	TEST 8	TEST 9	TOTAL 1-9	TOTAL 1-5
73	49	56	44	58	38	37	52	43	52	429	245
74	49	68	60	58	32	49	52	53	58	479	267
75	44	68	52	43	40	54	45	37	52	435	247
76	59	68	47	50	63	49	65	48	58	507	287
77	44	47	32	43	44	58	65	48	35	416	210
78	49	74	35	48	50	45	71	53	58	483	256
79	54	59	57	50	67	62	58	64	67	538	287
80	54	53	43	57	55	49	52	59	44	466	262
81	28	62	52	36	32	49	52	43	61	415	210
82	59	65	54	36	48	41	65	59	64	491	262
83	44	65	33	37	51	45	65	37	32	409	230
84	44	65	58	65	51	54	52	53	55	497	283
85	54	71	50	53	55	45	58	70	58	514	283
86	54	59	43	55	41	52	48	44	43	439	254
87	44	62	68	53	48	62	32	59	64	492	275
88	54	74	55	69	46	62	65	53	55	533	298
89	54	65	49	58	59	54	65	43	46	493	285
90	34	65	46	43	48	49	58	43	58	444	236
91	54	53	49	50	25	53	58	59	32	433	231
92	54	53	47	53	48	45	65	48	52	465	255
93	64	77	69	58	55	71	65	64	78	601	323
94	54	59	47	55	61	49	58	48	52	483	276
95	59	62	49	58	44	62	52	48	49	483	272
96	49	65	57	67	67	54	52	43	38	492	305
97	54	74	57	57	48	62	65	37	52	506	290
98	49	65	41	57	55	49	52	53	55	476	264
99	59	50	47	46	50	41	65	59	46	463	252
100	59	71	68	53	55	71	65	48	49	539	306
101	54	71	50	58	59	45	45	37	58	477	292
102	49	68	47	44	67	41	52	53	35	456	275
103	49	71	64	39	63	58	65	59	49	517	286
104	64	56	49	58	63	66	45	59	49	509	290
105	59	59	46	41	40	62	58	32	49	446	245
106	49	65	64	62	50	49	65	59	64	527	290
107	54	68	58	48	59	41	45	48	38	459	287
108	54	35	57	39	48	58	52	43	38	424	233
109	54	62	74	62	59	66	52	64	67	560	311
110	54	65	58	51	67	54	65	59	61	534	295
111	59	59	54	57	55	54	58	53	49	498	284
112	54	71	55	64	67	45	58	53	44	511	251
113	49	50	47	43	57	33	58	57	78	472	246

TABLE IX

TEAM TEST SCORES AND GAME SCORES OF ONE-HUNDRED GAMES PLAYED USING SCORES ON TESTS ONE THROUGH FIVE AS A BASIS FOR DETERMINING THE FIVE ITEM TEAM TEST SCORE

TEAM TEST SCORE WINNER	TEAM TEST SCORE LOSER	TEAM TEST SCORE DIFFERENCE	GAME SCORE WINNER	GAME SCORE LOSER	GAME SCORE DIFFERENCE
1267	1262	5	26	14	12
1352	1258	67	24	11	13
1326	1132	194	25	8	17
1419	1368	51	31	10	21
1294	1211	83	14	5	9
1299	1243	56	27	8	19
1253	1139	114	21	17	4
1378	1356	22	20	9	11
1331	1204	127	17	8	9
1401	1400	1	28	18	10
1363	1278	85	16	6	10
1304	1229	75	15	6	9
1358	1185	173	19	11	8
1386	1357	29	20	8	12
1412	1305	107	15	2	13
1410	1260	150	32	13	19
1425	1244	181	22	12	10
1342	1326	16	11	8	6
1276	1217	59	12	4	8
1348	1304	44	6	3	3
1440	1279	161	26	14	12
1434	1335	99	20	9	11
1439	1390	49	26	24	2
1434	1327	107	14	10	4
1491	1198	293	10	3	7
1416	1410	6	16	15	1
1414	1263	151	28	22	6
1391	1381	10	9	8	1
1339	1280	59	25	18	7
1420	1324	96	22	5	17
1432	1343	89	13	7	6
1392	1242	150	12	9	3
1337	1274	63	12	8	4
1400	1338	62	10	8	2
1407	1315	92	12	10	2
1315	1275	40	13	6	7
1468	1410	58	19	13	6
1393	1279	114	30	18	12
1340	1328	12	16	7	9

TABLE IX (continued)

TEAM TEST SCORES AND GAME SCORES OF ONE-HUNDRED GAMES PLAYED USING SCORES ON TESTS ONE THROUGH FIVE AS A BASIS FOR DETERMINING THE FIVE ITEM TEAM TEST SCORE

TEAM TEST SCORE WINNER	TEAM TEST SCORE LOSER	TEAM TEST SCORE DIFFERENCE	GAME SCORE WINNER	GAME SCORE LOSER	GAME SCORE DIFFERENCE
1347	1331	16	16	15	1
1447	1381	66	13	12	1
1394	1368	26	10	8	2
1321	1306	15	16	14	2
1402	1383	19	14	12	2
1453	1412	41	27	22	5
1366	1316	50	20	12	8
1349	1321	28	15	14	1
1413	1296	117	18	9	9
1400	1338	62	23	2	21
1401	1384	17	14	11	3
1427	1277	50	28	8	20
1388	1322	66	24	11	13
1344	1339	5	15	13	2
1449	1389	60	17	7	10
1330	1254	76	10	8	2
1419	1271	220	33	4	29
1438	1325	113	22	10	12
1332	1274	58	15	14	1
1351	1282	69	17	13	4
1278	1258	20	14	8	6
1399	1377	22	32	18	14
1336	1316	20	21	8	13
1278	1144	34	18	12	6
1365	1272	93	13	7	6
1396	1350	46	12	6	6
1349	1249	100	14	12	2
1412	1236	176	32	8	24
1367	1284	83	22	18	4
1344	1237	107	18	12	6
1460	1305	155	14	12	2
1338	1206	78	18	14	4
1357	1234	123	16	14	2
1447	1218	259	18	4	14
1304	1292	12	27	10	17
1331	1157	174	16	12	4
1385	1204	181	24	9	15
1389	1377	12	13	11	2
1438	1368	70	14	10	4

TABLE IX (continued)

TEAM TEST SCORES AND GAME SCORES OF ONE-HUNDRED GAMES PLAYED USING SCORES ON TESTS ONE THROUGH FIVE AS A BASIS FOR DETERMINING THE FIVE ITEM TEAM TEST SCORE

TEAM TEST SCORE WINNER	TEAM TEST SCORE LOSER	TEAM TEST SCORE DIFFERENCE	GAME SCORE WINNER	GAME SCORE LOSER	GAME SCORE DIFFERENCE
1392	1220	172	16	5	11
1429	1401	28	33	14	19
1387	1295	95	27	5	22
1361	1326	35	14	6	8
1262	1361	-99	19	11	8
1370	1420	-50	14	12	2
1298	1329	-31	11	9	2
1245	1327	-82	29	11	18
1300	1422	-78	12	8	4
1342	1300	-42	15	6	9
1225	1347	-122	18	10	8
1353	1403	-50	17	9	8
1337	1321	-16	17	8	9
1389	1342	-47	19	13	6
1132	1270	-168	20	14	6
1368	1430	-62	22	12	8
1396	1280	-116	13	8	5
1390	1371	-19	29	12	17
1297	1368	-71	19	7	12
1269	1312	-42	23	16	7
1309	1202	107	8	8	0
1327	1300	27	7	7	0

TABLE X

PENNY-CUP TEAM TEST SCORES, GAME SCORES,
AND GAME SCORE DIFFERENCES

TEAM TEST SCORE WINNER	TEAM TEST SCORE LOSER	TEAM TEST SCORE DIFFERENCE	GAME SCORE WINNER	GAME SCORE LOSER	GAME SCORE DIFFERENCE
260	239	21	20	5	15
275	260	15	18	9	9
260	255	5	28	14	14
280	265	15	19	4	15
255	260	-5	9	8	1
265	270	-5	10	4	6
234	270	-36	9	6	3
245	255	-10	30	3	27

TABLE XI

SPEED DRIBBLE TEAM TEST SCORES, GAME SCORES,
AND GAME SCORE DIFFERENCES

TEAM TEST SCORE WINNER	TEAM TEST SCORE LOSER	TEAM TEST SCORE DIFFERENCES	GAME SCORE WINNER	GAME SCORE LOSER	GAME SCORE DIFFERENCE
288	277	11	15	12	3
319	298	21	17	9	8
340	234	106	22	4	18
307	283	24	16	4	12
307	289	36	9	8	1
325	346	-39	19	16	3
269	295	-26	8	6	2
280	280	0	12	9	3

TABLE XII

FIELD GOAL SPEED TEAM TEST SCORES, GAME SCORES, AND GAME SCORE DIFFERENCES

TEAM TEST SCORE WINNER	TEAM TEST SCORE LOSER	TEAM TEST SCORE DIFFERENCE	GAME SCORE WINNER	GAME SCORE LOSER	GAME SCORE DIFFERENCE
255	231	24	18	16	2
227	226	1	11	8	3
242	229	13	13	11	2
261	233	28	16	5	9
258	213	45	24	22	2
262	245	17	18	14	4
225	248	-23	22	8	14
227	268	-41	15	12	3

TABLE XIII

SPEED PASS TEAM TEST SCORES, GAME SCORES AND GAME SCORE DIFFERENCES

TEAM TEST SCORE WINNER	TEAM TEST SCORE LOSER	TEAM TEST SCORE DIFFERENCE	GAME SCORE WINNER	GAME SCORE LOSER	GAME SCORE DIFFERENCE
267	231	36	16	12	4
283	275	8	11	7	4
260	254	6	15	12	3
223	257	-34	18	13	5
217	238	-21	8	5	3
267	285	-18	22	15	7
267	249	18	15	15	0
256	218	38	16	16	0

TABLE XIV

VERTICAL JUMP TEAM TEST SCORES, GAME SCORES, AND GAME SCORE DIFFERENCES

TEAM TEST SCORE WINNER	TEAM TEST SCORE LOSER	TEAM TEST SCORE DIFFERENCE	GAME SCORE WINNER	GAME SCORE LOSER	GAME SCORE DIFFERENCE
233	219	14	22	12	10
252	219	33	16	10	6
281	248	33	3	2	1
219	217	2	27	18	9
274	221	53	20	9	11
212	236	-24	9	8	1
251	261	-10	10	9	1
239	244	-5	26	4	22

TABLE XV

MEANS AND MEAN DIFFERENCES OF BOTH TEST ADMINISTRATIONS

TEST	MEAN TEST I	MEAN TEST II	MEAN DIFFERENCE
Penny-Cup	10.4	9.26	-1.14
Speed Dribble	14.9	14.08	-0.82
Field Goal	20.7	24.02	3.32
Speed Pass	42.2	43.14	2.94
Vertical Jump	18.6	20.01	1.41
Side Shift	21.1	21.70	0.60
Dash	10.6	9.89	-0.71
Accuracy Shoot	3.4	4.00	0.60
Accuracy Pass	34.2	35.59	1.39

TABLE XVI

RHO CORRELATION OF TEST SCORE DIFFERENCES WITH GAME SCORE DIFFERENCES

GAME	TEST SCORE D	TEST SCORE Rx	GAME SCORE D	GAME SCORE Ry	Rx-Ry	RD^2
1	5	98.5	12	24.5	74.0	5476.00
2	67	48.0	13	19.5	28.5	812.25
3	194	4.0	17	12.5	8.5	72.25
4	51	61.0	21	4.5	56.5	3192.25
5	83	38.5	9	38.0	0.5	0.25
6	56	60.0	19	8.0	52.0	2704.00
7	114	22.5	4	71.0	48.5	2352.25
8	22	82.5	11	29.0	53.5	2862.25
9	127	17.0	9	38.0	19.0	361.00
10	1	100.0	10	32.5	77.5	6006.25
11	85	37.0	10	32.5	4.5	20.25
12	74	44.0	9	38.0	6.0	36.00
13	173	19.0	8	45.5	26.5	702.25
14	29	77.0	12	24.5	52.5	2756.25
15	107	25.5	13	19.5	6.0	36.00
16	150	15.5	19	8.0	7.5	56.25
17	181	5.5	10	32.5	27.0	729.00
18	16	89.5	6	59.5	30.0	900.00
19	59	56.5	8	45.5	11.0	121.00
20	44	67.0	3	77.0	10.0	100.00
21	161	12.0	12	24.5	12.5	156.25
22	99	30.5	11	29.0	11.5	2.25
23	49	66.0	2	85.5	19.5	380.25
24	107	25.5	4	71.0	45.5	2070.25
25	293	1.0	7	51.0	50.0	2500.00
26	6	97.0	1	95.5	2.5	6.25
27	151	14.0	6	59.5	45.5	2070.25
28	10	96.0	1	95.5	0.5	0.25
29	59	56.5	6	59.5	3.0	9.00
30	96	35.0	17	12.5	22.5	506.25
31	89	35.0	6	59.5	23.5	552.25
32	150	15.5	3	77.0	61.5	3782.25
33	63	51.0	4	71.0	20.0	400.00
34	62	52.5	2	85.5	33.0	1089.00
35	92	35.0	2	85.5	50.5	2550.25
36	40	73.0	7	51.0	22.0	484.00
37	58	58.5	6	59.5	1.0	1.00
38	114	22.5	12	24.5	2.0	4.00
39	12	93.5	9	38.0	55.5	3080.25
40	16	89.5	1	95.5	6.0	36.00

TABLE XVI (continued)

RHO CORRELATION OF TEST SCORE DIFFERENCES
WITH GAME SCORE DIFFERENCES

GAME	TEST SCORE D	TEST SCORE Rx	GAME SCORE D	GAME SCORE Ry	Rx-Ry	RD^2
41	66	49.5	1	95.5	46.0	2116.00
42	26	81.0	2	85.5	4.5	20.25
43	15	92.0	2	85.5	6.5	42.25
44	19	86.5	2	85.5	1.0	1.00
45	41	72.5	5	65.5	6.5	42.25
46	50	62.5	8	45.5	17.0	289.00
47	28	78.5	1	95.5	17.0	289.00
48	117	20.0	9	38.0	18.0	2304.00
49	62	52.5	21	4.5	48.0	2304.00
50	17	88.0	3	77.0	11.0	121.00
51	50	62.5	20	6.0	56.5	3192.25
52	66	49.5	13	19.5	30.0	900.00
53	5	98.5	2	85.5	13.0	169.00
54	60	55.0	10	32.5	22.5	506.25
55	76	43.0	2	85.5	42.5	1806.25
56	220	3.0	29	1.0	2.0	4.00
57	113	24.0	12	24.5	0.5	0.25
58	58	62.5	1	95.5	33.0	1089.00
59	69	47.0	4	71.0	24.0	576.00
60	20	84.5	6	59.5	25.0	625.00
61	22	82.5	14	16.5	66.0	4356.00
62	20	84.5	13	19.5	65.0	4225.00
63	34	75.0	6	59.5	15.5	240.25
64	93	34.0	6	59.5	25.5	650.25
65	46	68.0	6	59.5	8.5	72.25
66	100	29.0	2	85.5	56.5	3192.25
67	176	7.0	24	2.0	5.0	25.00
68	83	38.5	4	71.0	42.5	1806.25
69	107	25.5	6	59.5	34.0	1156.00
70	155	13.0	2	85.5	72.5	5256.25
71	78	41.5	4	71.0	29.5	870.25
72	123	18.0	2	85.5	67.5	4556.25
73	259	2.0	14	17.5	15.5	240.25
74	12	93.5	17	12.5	81.5	6642.25
75	174	8.0	4	71.0	63.0	3969.00
76	181	5.5	15	15.0	9.5	90.25
77	12	93.5	2	85.5	8.0	64.00
78	70	46.0	4	71.0	25.0	625.00
79	172	10.0	11	29.0	19.0	361.00
80	28	78.5	19	8.0	70.5	4970.25

TABLE XVI (continued)

RHO CORRELATION OF TEST SCORE DIFFERENCES
WITH GAME SCORE DIFFERENCES

GAME	TEST SCORE D	TEST SCORE Rx	GAME SCORE D	GAME SCORE Ry	Rx-Ry	RD^2
81	95	33.0	22	3.0	30.0	900.00
82	35	74.0	8	45.5	28.5	812.25
83	99	30.5	8	45.5	15.0	825.00
84	50	66.5	2	85.5	19.0	361.00
85	31	76.0	2	85.5	9.5	90.20
86	82	40.0	18	11.0	29.0	841.00
87	78	41.5	4	71.0	29.5	870.25
88	42	70.5	9	38.0	32.5	1056.25
89	22	19.0	8	45.5	26.5	702.25
90	50	62.5	8	45.5	17.0	289.00
91	16	89.5	9	38.0	51.5	2652.25
92	47	67.0	6	59.5	7.5	56.25
93	68	11.0	6	59.5	5.0	25.00
94	62	52.5	8	45.5	7.0	49.00
95	116	21.0	5	65.5	44.5	1980.25
96	19	86.5	17	12.5	74.0	5476.00
97	71	45.0	12	24.5	20.5	420.25
98	42	70.5	7	51.0	19.5	380.25
99	107	25.5	0	99.5	74.0	5476.00
100	27	80.0	0	99.5	19.5	380.25

DIAGRAM I

BASKETBALL GAME SCORE SHEETS

COURT ___

GAME _____

CLASS _____

DATE _____

TEAM "A"

NAME	TEST VALUE	SCORING	TOTAL POINTS

TOTAL TEST VALUE _____

REFEREES _____

SCORER _____

TEAM "B"

NAME	TEST VALUE	SCORING	TOTAL POINTS

TOTAL TEST VALUE _____

TEAM "A" TEST VALUE _____ GAME SCORE _____

TEAM "B" TEST VALUE _____ GAME SCORE _____

DIAGRAM II

INDIVIDUAL BASKETBALL TEST SCORE SHEET

NAME_____ AGE_____ HEIGHT _____ WEIGHT_____

NUMBER AND HOUR OF COURSE _____

	TEST SCORE	TEST VALUE	TEST SCORE	TEST VALUE	IMPROVEMENT
Penny-Cup Test					
Speed Dribble Test					
Field Goad Speed Test					
Speed Pass Test					
Vertical Jump Test					
Side Shift Test					
Dash Test					
Accuracy Shoot Test					
Accuracy Pass Test					

TOTAL OF TESTS 1-9 _____

TOTAL OF TESTS 1-5 _____