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VALIDATION OF THE JAMES-LOWELL RACQUETBALL TEST: A SKILLS
AND ABILITY TEST FOR USE IN INSTRUCTIONAL RACQUETBALL

Middle Tennessee State University

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VALIDATION OF THE JAMES-LOWELL RACQUETBALL
TEST: A SKILLS AND ABILITY TEST FOR
USE IN INSTRUCTIONAL RACQUETBALL

James A. Shemwell, Jr.

A dissertation presented to the
Graduate Faculty of Middle Tennessee State University
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VALIDATION OF THE JAMES-LOWELL RACQUETBALL
TEST: A SKILLS AND ABILITY TEST FOR
USE IN INSTRUCTIONAL RACQUETBALL

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ABSTRACT

VALIDATION OF THE JAMES-LOWELL RACQUETBALL TEST: A SKILLS AND ABILITY TEST FOR USE IN INSTRUCTIONAL RACQUETBALL

by James A. Shemwell, Jr.

The main purpose of the study was to validate the James-Lowell Racquetball Test (JLRBT), Form A: Knowledge, and Form B: Ability. A secondary purpose was to establish reliability and construct norms for the JLRBT, Form B.

Validation of Form A was accomplished by an item analysis utilizing the Flanagan Method as described by Scott and French. Validation of Form B occurred by correlating the instructors' subjective rating of each subject's overall racquetball ability and the initial test scores of the subjects on the JLRBT, Form B. Reliability was established by correlating the initial test scores and the retest scores of the subjects on the JLRBT, Form B. Norms were established utilizing the Sigma Scale. All correlation utilized the Pearson product-moment method of correlation.

The population for the study was taken from eleven racquetball activity classes at Middle Tennessee State University in the fall, 1980, semester. A total of 180 male

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and female students, aged 17 to 48 years, were administered the JLRBT, Form A, a fifteen-item racquetball knowledge test, prior to Form B, an ability test consisting of three consecutive thirty-second front wall rallies. Form B utilized a ten by twelve foot restraining rectangle and a line on the front wall five feet above the floor.

FINDINGS

According to the standards set by Scott and French, the item analysis resulted in thirteen items (86.6%) being acceptable items for racquetball knowledge. Two items (13.4%) required revising.

Seven instructors teaching eleven racquetball classes subjectively rated their individual students' overall racquetball ability. The following rating scale was used: 5--Excellent, 4--Good, 3--Average, 2--Poor, 1--Very Poor. The subjective rating of the students occurred during the administration of Form B; however the instructors were unaware of the subjects' final test scores. Validity coefficients were obtained between the instructors' subjective ratings and the initial test scores. Coefficients for each coeducational class ranged from a low of $r = .31$ to a high of $r = .82$. When all instructor ratings were correlated with all subjects' initial test scores, $r = .59$ was produced. The initial instructor ratings obtained a

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positive correlation of $r = .50$ with the initial test scores of male subjects and $r = .495$ with the initial test scores of female subjects.

The test-retest method was used to establish reliability for Form B. The subjects consisted of 165 of the total population. When initial test scores of all 165 subjects were correlated with retest scores, $r = .81$ was produced. The initial test scores of male subjects obtained a positive correlation of $r = .77$ with male retest scores. The initial test scores of female subjects obtained a positive correlation of $.6596$ with female retest scores.

All correlations were significant at the $.01$ level.

Male subjects obtained a mean score of 17.53 on the initial test of Form B, while female subjects obtained a mean score of 10.0. As a group males scored higher than females on Form B.

ACKNOWLEDGEMENTS

This study could never have been completed without the help, cooperation, encouragement, and understanding of many people. It is virtually impossible to name each individual who helped with the study. However, the writer would like to give special thanks to the following people.

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Chapter 1

INTRODUCTION

Physical education is recognized as a vital part of an individual's total education. Through the medium of movement, physical education seeks to educate individuals.¹ Sports activities, as racquetball, serve as an important means for achieving the objectives and goals of physical education. Increasing and improving one's mental, physical, and social skills are desirable goals which are sought in the activity curriculum. Instructors seek to produce a learning environment which results in each individual student improving his own physical, mental, and social skills.²

To encourage participation of individuals, physical educators have sought to improve, modify, or create activities that will provide a wide range of physical, mental, and social experiences. Racquetball is a popular,

¹Craig A. Buschner, "The Validation of a Racquetball Skills Test for College Men" (unpublished Doctoral dissertation, Oklahoma State University, 1976), p. 1.

²Harrison H. Clarke, Application of Measurement to Health and Physical Education (Englewood Cliffs: Prentice-Hall, Inc., 1976), p. 300.

new sports activity that has been added to the list of those already established which provides students with a wide range of activities that encourages and allows lifetime participation. To meet the demand for the fast-growing sport, racquetball instructors have sought to develop and improve racquetball instruction. Through research, devices have been developed to assist the instructor not only in the evaluation process but also in the instructional process. New or improved instructional techniques aimed at improving individual instruction have been produced and tested. These techniques are identified by titles as individualized or programmed instruction,³ personalized system of instruction,⁴ and mastery learning.⁵ Other aids, as skills tests for evaluative purposes, have been produced widely and researched.⁶ Ability tests for classification of students into homogeneous groupings have been used in some sports

³Joan E. Farrell, "Programmed vs Teacher-Directed Instruction in Beginning Tennis for Women," Research Quarterly, XLI (March, 1970), 51-57.

⁴Fred S. Keller and J. Gilmour Sherman, The Keller Plan Handbook: Essays on a Personalized System of Instruction (Manlo Park: W. A. Benjamin, Inc., 1974), p. 15.

⁵Benjamin S. Bloom, "Learning for Mastery," Evaluation Comment, I (May, 1968), 1.

⁶Donald K. Mathews, Measurement in Physical Education (Philadelphia: Wm. B. Saunders Co., 1973), pp. 161-162.

activities.⁷ Research is essential in racquetball because new tests are needed to improve or create methods of meeting the needs of individuals.

NEED FOR THE STUDY

Today, educators have become concerned deeply with the problem of increasing the efficiency and economy of learning.⁸ Educators have long realized that students are individuals and, ideally, instruction should be individualized or personalized.⁹ Mosston states that "learning is an individual process . . . no one can learn for another . . . each individual learns at his own rate and manner."¹⁰ In racquetball activity classes, instructors have been faced with the problem of teaching students whose individual abilities are as varied as the number of students enrolled. Student variations not only will include

⁷Jack E. Hewitt, "Classification Tests in Tennis," Research Quarterly, XXXIX (October, 1968), 552-555.

⁸Donald R. Fuetges, "The Effect of Programmed Instruction on Selected Tennis Skills, Knowledge and Attitude" (unpublished Doctoral dissertation, University of Utah, 1971), p. 1.

⁹John E. Nixon and Ann E. Jewett, An Introduction to Physical Education (Philadelphia: Wm. B. Saunders Co., 1974), p. 12.

¹⁰Muska Mosston, Teaching Physical Education (Columbus: Charles E. Merrill Books, Inc., 1966), p. 97.

differences in age and sex but also in physical coordination, previous experience, and level of present physical activity. Realizing that each individual will have a variety of needs, the instructor must be equipped to cope with the instructional challenge, that is, planning a program of racquetball instruction which will improve and increase each individual's physical, mental, and social skills through the activity. Utilization of valid instructional techniques, tools, or aids should increase the success of the instructor and his students.

A widely accepted instructional technique is the classification or grouping of students. In racquetball activity classes, grouping students for instructional purposes should occur through a valid method of classification. These methods should be based on such factors as size, maturity, strength, speed, ability to learn physical skills, and motor achievement.¹¹ Classification according to racquetball ability should result in the students being placed at a level of instruction wherein they are able to work and compete without becoming discouraged, overworked, or bored.¹²

¹¹Charles H. McCloy and Norma D. Young, Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, Inc., 1942), p. 403.

¹²Victor H. Noll, Introduction to Educational Measurement (Boston: Houghton-Mifflin Company, 1957), p. 354.

Clarke states that grouping individuals according to ability has in the past been considered primarily a phase of the social development program. However, he reports that there are two other values in grouping students of physical education: (1) pedagogical advantages and (2) desirable attitudes toward physical education. The pedagogical advantages discussed by Clarke are that class instruction is more efficient when the abilities of students are similar and that serious problems occur when heterogeneous grouping is applied. Class work may be geared toward the less able student or the average student. In either case other levels of students suffer. Also, grouping those of equal or similar ability allows the instructor to present skills more effectively and efficiently.¹³

A second value of grouping is to ensure a real and lasting interest and participation in physical education activities. To ensure continued participation beyond the classroom, racquetball instructors should attempt to develop desirable attitudes toward physical education activities. The acquisition of the desired attitude toward physical education within the racquetball activity class depends upon the acquired skills and satisfying experiences of the student. Ability grouping in racquetball activity classes

¹³Clarke, p. 199.

not only allows the students to participate in a situation where they are competitive but also should result in more effective teaching which is better organized and adapted to the ability level of the individuals.¹⁴ Other benefits of classifying according to ability may be increased participation, some success, a chance to excel, recognition, a feeling of belonging, and security. Therefore, the social development of the racquetball student is enhanced and a positive attitude toward physical activity is produced.¹⁵

Bucher lists the following statements concerning the grouping of students.

1. The need for grouping students homogeneously for instruction and competition has long been recognized, but the inability to scientifically measure such important factors as ability, maturity, interest and capacity has served as a deterrent from accomplishing this goal.
2. The most common procedure for grouping today is by grade or class.
3. The ideal grouping organization would take into consideration all factors that affect performance--intelligence, capacity, interest, knowledge, age, height, weight, etc.
4. Some form of grouping is essential to provide the type of program that will promote educational objectives and protect the student.

¹⁴Clarke, p. 200.

¹⁵Charles A. Bucher, Administration of Health and Physical Education Programs Including Athletics (Saint Louis: The C. V. Mosby Company, 1975), p. 143.

5. On the secondary and college levels, the most feasible procedure appears to be to organize subgroups within the regular physical education class proper.
6. Classification within the physical education class should be based on such factors as age, height, and weight statistics and other factors such as interest and skill that are developed as a result of observation of the activity.
7. For those individuals who desire greater refinement in respect to grouping, utilization of motor capacity, motor ability, attitude appreciation, and sports-skills tests may be used.¹⁶

Any classification or grouping of students should be flexible and subject to change in accordance with individual differences. It would be best for the racquetball instructor at the beginning of the program to classify as accurately as possible.¹⁷ For racquetball activity service classes, valid tests of ability, which can be given with ease and economy and allows the instructor to classify individuals for instructional purposes, will enhance greatly the instructional program.

In a democratic community where the worthiness of the individual is prized, racquetball instructors should attempt to utilize whatever proven resources may be available to them in their efforts to lead their students toward the goals and objectives of physical education.

¹⁶Bucher, p. 143.

¹⁷McCloy and Young, p. 403.

Classification of students into homogeneous groups within racquetball activity classes is an accepted method of improving instruction.¹⁸ The learning process can be enhanced significantly when students with similar racquetball ability levels can practice and play together.¹⁹

STATEMENT OF THE PROBLEM

Instructors of coeducational racquetball service classes are faced with a dilemma at the beginning of each new instructional period. They often are uncertain of the playing ability and knowledge level of the students entering the racquetball class. They may assume that all are beginners and plan the instructional program on that basis. For those students whose ability exceeds that of a beginner, the full benefit of the instructional period is never realized. Some racquetball instructors may take the time to evaluate subjectively and rate each student in order to plan a more effective instructional program, one that will improve each individual's specific needs. The process of subjective evaluation takes up valuable instructional time. Valid racquetball ability tests are needed that can be given with ease and economy of time and equipment and which allow the instructor to classify students so that the formulation

¹⁸Bucher, p. 143.

¹⁹Hewitt, pp. 552-555.

of a more flexible, individualized program may result. Thus, the instructional program will be enhanced by being better able to meet the needs of the individuals enrolled.²⁰

PURPOSES OF THE STUDY

The main purpose of this study was to validate the James-Lowell Racquetball Test: A Skills and Ability Test for Instructional Racquetball (JLRBT). A secondary purpose was to establish reliability and construct norms for the JLRBT, Form B. The test was developed by Jon L. MacBeth and James A. Shemwell to provide a means of classifying students according to their racquetball ability. In addition to the classification of students, the test may be used for pre- and posttesting or self-evaluation of students' racquetball ability.²¹

HYPOTHESES

The hypotheses of this investigation were as follow:

²⁰Bucher, p. 143.

²¹Jon L. MacBeth and James Shemwell, "The James-Lowell Racquetball Test: A Skills and Ability Test for Use in Instructional Racquetball," Proceedings of a National Symposium on the Racquet Sports (Urbana-Champaign: The University of Illinois, 1979), pp. 175-183.

HO₁: The items included in the James-Lowell Racquetball Test, Form A: Knowledge (JLRBT, Form A), will not be valid measures of beginning racquetball knowledge.

HO₂: There will be a significant difference between the initial instructor ratings and the initial test scores for all subjects combined and male subjects and female subjects separately on the James-Lowell Racquetball Test, Form B: Ability (JLRBT, Form B).

HO₃: There will be a significant difference between the initial test scores and retest scores for all subjects combined and male subjects and female subjects separately on the JLRBT, Form B.

LIMITATIONS

1. The subjects selected for this study will not be selected randomly but will be limited to those students enrolled in eleven coeducational racquetball activity classes during the 1980 fall semester at Middle Tennessee State University, Murfreesboro, Tennessee.

2. The panel of judges will be limited to the instructor of each racquetball class being tested at that time and will be limited in that each instructor will rate only those students enrolled in his classes.

3. Due to the number of classes, the test will be administered during regular class time, and data collection will be limited to one week.

4. The criterion measure will be limited to the instructors' subjective evaluation of their students' overall racquetball ability. Intra- and inter-rater reliability was assumed to be valid.

DEFINITIONS OF TERMS

Ability test--a test which measures one's level of ability in a specific sports activity.²²

Classification of students--the placement of individuals into groups for a particular purpose.²³

Homogeneous grouping--grouping individuals according to specific abilities.²⁴

Knowledge test--a discriminatory test that measures one's level of knowledge in a specific subject and classifies individuals into ability groups.²⁵

Skills test--a test that is used for measuring the ability of an individual in a specific sport.²⁶

²²Clarke, p. 228.

²³Harold M. Barrow and Rosemary McGee, A Practical Approach to Measurement in Physical Education (Philadelphia: Lea and Febiger, 1975), p. 517.

²⁴Noll, p. 359.

²⁵Ted A. Baumgartner and Andrew S. Jackson, Measurement for Evaluation in Physical Education (Boston: Houghton-Mifflin Company, 1975), pp. 285-286.

²⁶Mathews, p. 9.

Reliability--the extent to which a test is consistent in measuring whatever it does measure.²⁷

Validity--the extent to which a test does the job for which it is used.²⁸

RACQUETBALL TERMINOLOGY

Backcourt--court area behind the short line.²⁹

Backhand--fundamental stroke on the opposite side from which arm the stroke is made.³⁰

Ceiling ball--a shot in which the ball first comes in contact with the ceiling, then the front wall, and, finally, the floor, rebounding deep into the backcourt.³¹

Center court--that floor area starting at the short line and extending into the backcourt approximately five feet.³²

Court--the playing area.³³

²⁷Barrow and McGee, p. 585.

²⁸Barrow and McGee, p. 588.

²⁹Chuck Leve, Inside Racquetball (Chicago: Henry Regnery Co., 1973), p. 84.

³⁰Donald R. Casady, Sports Activities for Men (New York: Macmillan Publishing Co., Inc., 1974), p. 304.

³¹Steve Keeley, The Complete Book of Racquetball (Northfield: DBI Books, Inc., 1976), p. 262.

³²Keeley, p. 262.

³³A. William Fleming and Joel A. Bloom, Paddleball and Racquetball (Pacific Palisades, California: Goodyear Publishing Co., Inc., 1973), p. 6.

Follow-through--the continuous motion of the racquet after the ball has been hit.³⁴

Footwork--movement of the feet in correct relationship to the body and ball.³⁵

Forehand--fundamental stroke hit on the same side of the body of the racquet hand.³⁶

Front court--the area of the court in front of the short line including the service box.³⁷

Front wall--the wall at the front of the court.³⁸

Fundamentals--the basic skills of racquetball including grip, forehand, backhand, strokes, and footwork.³⁹

Grip--the way in which the racquet is held for the shot.⁴⁰

Paddleball--the predecessor of modern racquetball where a wooden paddle and deader ball with pinhole are employed under the same rules as racquetball.⁴¹

³⁴Fleming and Bloom, p. 6.

³⁵Keeley, p. 265.

³⁶Fleming and Bloom, p. 6.

³⁷Keeley, p. 265.

³⁸Keeley, p. 265.

³⁹Leve, p. 11.

⁴⁰Keeley, p. 265.

⁴¹Keeley, p. 268.

Rally--the playing time between the serve and the end of the point.⁴²

Serve--the act of putting the ball in play.⁴³

Service line--the front line parallel to and five feet in front of the short line.⁴⁴

Short line--the line halfway between and parallel to the front and back walls.⁴⁵

Stance--the body position taken by the player preparing to stroke the ball.⁴⁶

Starting position--the ready position or initial stance in anticipation of the next shot.⁴⁷

Volley--playing the ball in the air before it has bounced.⁴⁸

This concludes the discussion of Chapter 1. Chapter 2 will present a discussion concerning the review of related literature.

⁴²Fleming and Bloom, p. 8.

⁴³Fleming and Bloom, p. 8.

⁴⁴Keeley, p. 269.

⁴⁵Leve, p. 86.

⁴⁶Philip E. Allsen and Alan R. Whitbeck, Racquetball/Paddleball (Dubuque: Wm. C. Brown Company, 1977), p. 11.

⁴⁷Randy Stafford, Racquetball: The Sport for Everyone (Memphis: S. C. Toof Company, 1975), p. 44.

⁴⁸Fleming and Bloom, p. 9.

Chapter 2

REVIEW OF LITERATURE

For the purpose of clarity and readability, the investigator has divided the review of literature into three sections: Historical Review of Racquetball; Validation and Development of Racquetball Ability, Skills, and Achievement or Classification Tests; and Validation and Development of Related Racquet Sports Skills, Ability, Achievement or Classification Tests. The first section will review the historical highlights of the game of racquetball as stated by a variety of authors. The second section will review a number of studies concerning tests in racquetball for measuring skills, ability, achievement or for classification of students for instructional purposes. The third section contains a discussion of the research in related racquet sports, specifically the sports of tennis, handball, and squash rackets.

HISTORICAL REVIEW OF RACQUETBALL

Although sources report differing information concerning the actual beginnings of the sports activity named racquetball, few can deny the high note of popularity

since 1969 when the newly formed International Racquetball Association sponsored the first official International Racquetball Championships in St. Louis, Missouri. Scott states that apparently no one thought the game was important enough to record what was happening or when and where it happened, thus leaving the history to facile imagination rather than facts.¹

Spear suggests that racquetball was never invented, but it evolved from a variety of racquet sports and court games with ancestry which extends back into history for several hundreds of years. Trying to trace the game through a single line of ancestry seems impossible. Spear mentions the beginnings of contributing sports including the French game of court tennis in the thirteenth century, the Spanish game of jai alai in the seventeenth century, the British game of rackets in the late eighteenth century, the game of Irish handball which is at least 1,000 years old, and another British game called squash racquets made famous in the middle nineteenth century and thirty years later in the United States.²

A significant event took place in the evolution of racquetball when Early Risky of the University of Michigan

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¹Eugene Scott, Racquetball: The Cult (Garden City: Doubleday and Co., Inc., 1979), p. 8.

Eugene Scott, Racquetball: The Cult (Garden City: and Co., Inc., 1979), p. 8. 11
(New York: J. B. Lippincott Company, 1979), p. 15.

originated the concept of paddleball, the immediate predecessor of racquetball. There is little argument concerning the conception of the game of paddleball in the early year of the decade from 1920 to 1930.³

Riskey was the man who attempted to standardize the rules and equipment of paddleball and was instrumental in getting the game selected as the unofficial physical conditioner for the armed forces during World War II. From its use and popularity during the war years, the game was spread throughout the states and continued growing until 1961 when the first National Paddleball Tournament was held in Madison, Wisconsin.⁴

Racquetball had as ancestors both paddleball and handball, all three using the same rules and court specifications. The primary difference between paddleball and racquetball is the equipment. Paddleball equipment consists of a wooden paddle with or without holes and a softer and slower ball than that used in racquetball. As the name implies, racquetball equipment consists of a strung racquet and a ball which is harder and faster than the paddleball version.⁵

³Philip E. Allsen and Alan R. Whitbeck, Racquetball/Paddleball (Dubuque: Wm. C. Brown Company, 1977), p. 1.

⁴Scott, pp. 9-10.

⁵John W. Reznik (ed.), Championship Racquetball (Cornwall: Leisure Press, 1976), p. 11.

Credited with the transformation of the paddle to a strung racket is Joe Sobeck, the so-called "father of racquetball."⁶ Sobeck developed a strung racquet specifically designed for racquetball in 1949 and called his game paddle rackets. By 1965, paddle rackets had surpassed paddleball in popularity. In 1968 the first National Paddle Rackets Tournament was held in Milwaukee, Wisconsin.⁷ The next year paddle rackets was renamed racquetball so that any confusion between the new game and paddleball would be resolved.⁸

By 1970 there were 50,000 racquetball players in the United States, and a professional racquetball tour had been established. Popularity of the sport has grown continually. By 1978 there were more than eight million racquetball players in the United States and more than 800 clubs with about 17,000 individual courts. A recent survey by A. C. Neilson and Company has identified racquetball as the fastest growing sport in the United States. It has overtaken the growth rates of tennis and jogging. Neilson stated that "participation in racquetball is up 283 percent

⁶Steve Keeley, The Complete Book of Racquetball (Northfield: DBI Books, Inc., 1976), p. 262.

⁷Scott, p. 10.

⁸Spear, p. 17.

from 1976 to 1979 and currently boasts an estimated 10,654,000 participants."⁹

Today, there are two organizations concerned with the advancement of racquetball. The first organization was the previously mentioned International Racquetball Association established in 1969. In 1973 the president, Bob Kendler, resigned and organized the National Racquetball Club which is devoted to the development of professional racquetball.¹⁰

Within a short span of years, racquetball has gained popularity for a number of reasons. It is an excellent means of exercising, and it is fun. Men and women can get a good physical and mental workout in a short time, and very little equipment is needed. It can be enjoyed by children because of the "immediate success" factor.¹¹ Time is spent playing rather than chasing after balls. Many courts are indoors; thus, weather has no effect on when one can play.¹² The beneficial effects of participating in racquetball can be enjoyed by all sexes and ages. As more and better

⁹"Racquetball: The Sport of the 80's," Athletic Purchasing and Facilities, IV (April, 1980), 35-36.

¹⁰Spear, p. 17.

¹¹Jean Sauser and Arthur Shay, Teaching Your Child Racquetball (Chicago: Contemporary Books, Inc., 1978), p. i.

¹²Reznik, p. 3.

racquetball facilities are being constructed and popularity increases, many high schools, junior/community colleges, colleges, and universities are offering racquetball instruction on a recreational/educational basis.¹³

VALIDATION AND DEVELOPMENT OF RACQUETBALL
ABILITY, SKILLS, ACHIEVEMENT OR
CLASSIFICATION TESTS

The purpose of this section will be to review racquetball tests which determine levels of racquetball ability, skill, achievement or classification. Tests which have been validated as well as tests which have not been statistically validated will be included.

In 1972 Wickstrom and Larson noted that there were no standardized tests for measuring racquetball skill. They suggested a two-item skills test which included a rally test and a volley test. The rally test utilizes a thirty-second front wall rally in which the subject may use either the forehand or backhand stroke to rally the ball against the front wall. When rallying, the subject must stay behind the service line which is fifteen feet from and parallel to the front wall. A line taped across the front wall and four feet above the floor provides a target area for the subject. Only those hits which are below the taped line are scored.

¹³Craig A. Buschner, "The Validation of a Racquetball Skills Test for College Men" (unpublished Doctoral dissertation, Oklahoma State University, 1976), p. 4.

Three thirty-second trials are allowed and the total number of hits for three trials is the subject's score. The volleying test consists of the subject staying behind a restraining line ten feet from and parallel to the front wall and attempting to volley the ball off the front wall. The subject's score is the total number of hits against the front wall during three thirty-second trials.¹⁴ Reliability or validity coefficients have not been obtained for this test.

Buschner validated a battery of racquetball skills tests for college men in 1976. His purposes were to construct a skills test or battery of tests for the predicting of racquetball ability and classifying college males into levels of racquetball ability.¹⁵ The Buschner test contained five items which included a forehand/backhand rally, a backhand rally, a ceiling shot test, a front wall kill placement test, and a volley test. The criterion for validation was player success during a round-robin tournament. A player's success was determined by total points scored minus total points scored by opponents during the tournament. Each match lasted eight minutes.¹⁶

¹⁴Ralph Wickstrom and Charles Larson, Racquetball and Paddleball Fundamentals (Columbus: Charles E. Merrill Company, 1972), p. 75.

¹⁵Buschner, p. 31.

¹⁶Buschner, p. 31.

The multiple correlations of coefficients of .76 were obtained when the forehand/backhand rally test and the ceiling shot test were combined to obtain the most valid measure of beginning racquetball skill. The range of reliability for the forehand/backhand rally test, backhand rally test, ceiling shot test, and volley test was from .63 to .76. The kill shot placement test obtained the lowest reliability score with a .41. The validity score for each item was .68 for the forehand/backhand rally test, .49 for the backhand rally test, .64 for the volley shot, and .67 for the ceiling shot.¹⁷

Buschner suggests that the test items be repeated with a larger population and that, since few skills tests are available, the two-item battery merits consideration as a racquetball skills test.¹⁸

In 1977 Klass developed a battery of reaction time tests and a wall-volley skill test to predict racquetball ability of college men. Included in the study was a subproblem that was to see how racquetball playing ability related to electronic tennis playing ability. The battery of racquetball tests included the following items: the vertical jump reaction test, multiple choice reaction test, movement time test, and a wall-volley test. The criterion

¹⁷Buschner, pp. 37-40.

¹⁸Buschner, pp. 54-58.

selected for comparison was the subject's success in a round-robin singles tournament. Player success was determined by the difference between points scored versus points allowed. Also, winning percentage was reflected in a player's success.¹⁹

The data revealed a multiple correlation of .55 for predicting racquetball skills from the wall-volley test and the movement time reaction test. Reliability scores for the vertical jump reaction test, multiple choice reaction test, movement time test, and wall-volley test were low, ranging from .07 to .56. The wall-volley and round-robin tournament scores produced a coefficient of .53 while the wall-volley and winning percentage resulted in a coefficient of .56. The intracorrelations of racquetball skills scores and electronic tennis produced low coefficients with the highest, .21, for the electronic tennis winning percentage and the racquetball round-robin scores.²⁰

Reznik constructed a five-item battery of tests to measure selected racquetball skills. The test items included a sixty-second rally test, a sixty-second backhand rally test, a power drive test, a shot placement

¹⁹Robert Alan Klass, "The Validation of a Battery of Reaction Time Tests to Predict Racquetball Ability for College Men," Dissertation Abstracts International, XXXVIII (1978), A, 6563.

²⁰Klass, p. 6563.

test, and a service placement test. Reznik did not offer reliability or validity coefficients for any of the tests. However, he stated that the tests were presently being used at New Mexico State University in the racquetball classes.²¹

In 1977 Epperson reported the validation of the Reznik Racquetball Test. The criterion used for validation was the won-loss percentage while playing a singles round-robin tournament and points scored by a participant divided by the points scored by the opponents. The subjects included forty-four females and forty-four males in beginning racquetball classes. Reliability of all items except the shot placement test was above .80. Validity coefficients indicate that the forehand rally and shot placement tests were significant at the .05 level for the men while the forehand rally and the power drive tests were significant similarly for the women. Total time for the administration of the test was forty-five minutes per subject. Thus, due to its length, the test was impractical. However, the items cited for male and female were considered a practical battery for measuring racquetball skills.²²

Hensley, East, and Stillwell stated that according to their research no standardized test for the evaluation of

²¹Reznik, pp. 57-58.

²²Steve Epperson, "Validation of the Reznik Racquetball Test" (unpublished Master's thesis, Washington State University, 1977), pp. 13-17.

racquetball skill was available in 1978. They developed a valid racquetball skills test which could be utilized to evaluate achievement of selected racquetball skills for college men and women. The subjects consisted of 99 female and 113 male students in beginning coeducation racquetball classes. The subjects were administered a two-item racquetball skills test. The items included a short wall volley test and a long wall volley test. The short wall volley consisted of two thirty-second trials in which the subject attempted to volley the ball against the front wall while standing behind the short line of the court. The long wall volley was administered in the same manner as the short wall volley; however, the subject had to attempt to volley the ball against the front wall while standing behind a restraining line located twelve feet behind and parallel to the short line. Both tests are scored in the same manner; that is, one point is recorded for each time the ball legally hits the front wall during the thirty-second trial. The total score is the sum of legal hits during two thirty-second trials.²³

Reliability was determined by the intraclass correlation method calculated separately for men and women. Reliability estimates for the long wall were .82 for women

²³Larry D. Hensley, Whitfield B. East, and Jim L. Stillwell, "A Racquetball Skills Test," Research Quarterly, L (January, 1979), 114-118.

and .76 for men. Validity was established by using as the criterion subjective ratings of a panel of judges. The validity coefficients were combined for men and women resulting in a .79 for the short wall volley test and .86 for the long volley test.²⁴

Moore, Scott, and Harlan suggested four skills tests to help instructors in grading, self-testing, and self-evaluation: the rally test; the lob service; the low drive or power serve; and the kill shot. The authors provided a purpose, equipment and facilities needed, and testing procedures for each skill test. No reliability or validity coefficients were reported.²⁵

In 1979 Durstine and Drowatzky developed a test of racquetball skills for the purpose of predicting students' level of playing performance. Sixty-four men and women subjects were tested on forehand and backhand skills that included the following: (1) front-wall placement; (2) back-wall placement; (3) service placement; (4) power; (5) wall volley; and (6) agility. Correlations were obtained on predictor items for men at .80, for women at .75, and combined at .80. The authors developed predictor items for men which involved skill and accuracy. For women, the

²⁴Hensley, East, and Stillwell, pp. 114-118.

²⁵Alan C. Moore, Thomas M. Scott, and William E. Harlan, Racquetball for All (Dubuque: Kendall/Hunt Publishing Company, 1979), pp. 77-81.

predictor used was power as a lone item. A three-item test battery which could be used to equate students for skill instruction and competition for men and women combined was developed. Correlation coefficient for this test battery was .63 and included the following items: shuttle run; wall volley; and front-wall placement with backhand.²⁶

Bartee and Fothergill have developed a six-item battery of tests for racquetball skills. According to the authors, the test battery was designed to evaluate specific skills important to racquetball. The test items included: (1) z-serve; (2) lob serve; (3) drive serve; (4) control bounce; (5) wall pass; and (6) drop-kill test. Court markings were required and approximately eight students could be tested during a fifty minute class period. Fifty total hits were attempted by each subject. A ladder tournament was established with initial placement based upon the results of a round-robin tournament. At the conclusion of the instructional period, a comparison was made between subject's rank and the results of the test battery by utilizing the Pearson product-moment criterion. A correlation coefficient of .93 was found.²⁷

²⁶J. Larry Durstine and John N. Drowatsky, "Racquetball Success--Skill and More," Learning and Physical Education Newsletter, Volume 12, Number 1, Fall, 1979.

²⁷Horace Bartee and Richard W. Fothergill, "Tests of Racquetball Skills," Texas Association for Health, Physical Education and Recreation Journal, XLVIII (May, 1980), 8, 32.

VALIDATION AND DEVELOPMENT OF RELATED
RACQUET SPORTS SKILLS, ABILITY,
ACHIEVEMENT OR CLASSIFICATION
TESTS

This section will contain a review of literature concerned with the validation and development in related sports--specifically, tennis, handball, and squash racquets. Many of the skills, movements, and game strategies used in racquetball are the same or similar to those in tennis, handball, and squash racquets. This section will be divided into three sub-sections which will review literature in the related sports.

Tennis

In 1929 an early attempt to measure and classify high school girls into three levels of tennis ability was reported by Hartley. He described a series of tennis skills tests. The tests were divided into three ability levels: elementary, intermediate, and advanced. Each level was then subdivided into an A group and a B group with the A group being given a more difficult test. The skills tests included a forehand wall volley, a backhand wall volley, and service test for the elementary B group. The elementary A group had a forehand and backhand rally test in which the ball was stroked over the net and a service test in which the ball was served over the net. The intermediate group had a forehand rally test against a wall, a backhand rally

test against a wall, and a service test into the opposite court and correct court placement.²⁸

The difference between the A group and the B group was that the A group had to rally the ball more times than the B group. In the service placement test the A group was required to place more services within the correct court area than the B group. The intermediate level also had two items added to their tests, a lob test and a volley test. The advanced test included four items for group B which were the American forehand over the net, the forehand cut on the court, the backhand cut on the court, and a cut service with placement in the proper box. The test for the advanced group A is stated as a rally on court using all strokes. No reliability or validity coefficients were reported.²⁹

In 1934 Edgren designed a battery of five indoor tennis skills which measured present ability or progress. The battery included a serve for accuracy, speed in stroking, forehand stroke for accuracy, and a volley test. As with the Hartley classification tests, no validity or reliability coefficients were reported.³⁰

²⁸Grace Hartley, "Motivating the Physical Education Program for High School Girls," American Physical Education Review, XXXIV (May, 1929), 284-291.

²⁹Hartley, pp. 284-291.

³⁰Harry D. Edgren, "Tennis Technique," Journal of Health and Physical Education, V (May, 1934), 30-31, 56.

Dyer proposed a backboard tennis test which was valid and reliable. The Dyer Backboard Test was developed in 1935 and consisted of a backboard rally for a thirty-second time period. The score was the total number of hits which contacted the backboard above a specified line marked on the board. Dyer's purposes were to measure progress in tennis instruction and to classify individuals according to their tennis abilities. Reliability was estimated by the test-retest method and scored .84 to .90. Validity was established by correlating test scores with the ratings of a panel of judges. Scores of validity were reported to be .85 to .90.³¹

In 1938 Dyer revised the backboard test by adding a five-foot restraining line. Reliability increased to a range of .86 to .92 and validity increased from .94 to .99 range.³²

Another revision of the Dyer Backboard Test, which is a valid test for tennis ability and classification, was developed by Scott and French in 1959. These investigators moved the restraining line from Dyer's five feet to twenty-seven and one-half feet and noted that the test would measure general tennis ability of college students. The

³¹Joanna T. Dyer, "The Backboard Test of Tennis Ability," Supplement to the Research Quarterly, VI (March, 1935), 62-74.

³²Joanna T. Dyer, "Revision of the Backboard Test of Tennis Ability," Research Quarterly, IX (March, 1938), 25-31.

thirty-second trial and the scoring were the same as the Dyer test. Test scores were compared with the subjective ratings of a panel of judges and resulted in a validity coefficient of .61 while reliability coefficients were reported at .80. The authors suggested that this revision of the Dyer Backboard Test may be used for: (1) instructing, (2) measuring, and (3) grading.³³

In 1965 Hewitt revised the Dyer Backboard Test. Included in his revision was a larger target area on the backboard and the restraining line was placed at twenty feet from the wall. The net line was at the three foot height and the thirty-second trial was used. The subject scored a point for every legal ball that hit the backboard as long as the subject stayed behind the restraining line. The thirty-second trials were administered and the final score was the average of the three trials. Reliability for the group of advanced subjects was .93 and .82 for the beginners. Validity was compared to tournament standings and ranged from .68 to .89.³⁴

Broer and Miller developed a two-item tennis test which included a forehand and backhand drive test. The

³³Gladys M. Scott and Esther French, Measurement and Evaluation in Physical Education (Dubuque: Wm. C. Brown Company, Inc., 1959), pp. 222-225.

³⁴Jack E. Hewitt, "Revision of the Dyer Backboard Tennis Test," Research Quarterly, XXXVI (May, 1965), 153-157.

researchers constructed the test for grading purposes and for classification of students into beginning, intermediate, and advanced groups. Each female subject attempted fourteen backhand drive shots and fourteen forehand drive shots. Reliability coefficients for beginning tennis players was .80 and for the intermediate group was .80. Validity was obtained by correlating subjective ratings by a panel of judges and the student's performance on the test. The intermediate group correlation score was .85 and the beginning group score was .61.³⁵

Fox tested the validity of both the Dyer Backboard Test and the Miller Tennis Test in 1953. Fox concluded that backboard practice seemed to improve the subjects' performance on the Dyer and Miller tests. The validity coefficient for the Dyer Test that resulted when test scores were compared with subjective ratings by a panel of judges was .53. The Miller Test coefficient was .69.³⁶

In 1966 Hewitt constructed a tennis achievement test to evaluate the three fundamental skills of tennis: the serve; the backhand drive; and the forehand drive. The test

³⁵Marion R. Broer and Donna M. Miller, "Achievement Tests for Beginning and Intermediate Tennis," Research Quarterly, XXI (October, 1950), 303-321.

³⁶Katherine S. Fox, "A Study of the Validity of the Dyer Backboard Test and the Miller Forehand-Backhand Test for Beginning Tennis Players," Research Quarterly, XXIV (March, 1953), 1-7.

was constructed for use with beginning, advanced, and varsity tennis players. The reliability coefficients using the test-retest method ranged from .75 to .95. Validity coefficients when correlated with rankings after a round-robin tournament ranged from .52 to .93.³⁷

Another tennis test developed by Hewitt in 1968 was for classification purposes. Two items were included in this test. The first was a bounce test in which the subject while using the forehand grip bounced a tennis ball on the court with a minimum height being hip level for a thirty-second time period. The subject's score was the highest number of bounces made above the hip in three trials. The second item was a stroke test in which the subject hit the tennis ball up into the air above the shoulder while using and alternating the forehand grip and backhand grip. The score was the highest total number of hits out of three thirty-second trials. The reliability of the bounce test and the hit above the shoulder test was computed by repeating the tests in two successive class periods. The coefficient of correlation for the bounce test was .88 while the hit above the shoulder test was .83. Validity criterion was obtained from a class ranking after playing in a round-robin singles tournament and from the test scores.

³⁷Jack E. Hewitt, "Hewitt's Tennis Achievement Test," Research Quarterly, XXXVII (May, 1966), 231-240.

The tennis bounce coefficient ranged from a low of .56 to a high of .88 while the hit above the shoulder coefficient ranged from a low of .23 to a high of .88.³⁸

In 1968 Kemp and Vincent reported a rally test for the purpose of rating achievement in tennis playing skill and classification of students. The test also was developed to test players under game-like conditions. It required neither special equipment nor court markings such as the tests of Dyer, Hewitt, Broer-Miller, or Scott-French. However, a major limitation of this test was that a subject was dependent upon another subject in order to score. The test consisted of a rally in which two players rallied the ball as long as possible within a three-minute trial. Any strokes were allowed; however, any new rally had to begin from behind the service line. Scores were obtained by counting the number of times the ball contacted the racquet regardless of error. Errors were counted for each subject taking the test and were subtracted for each subject from the total number of hits. Validity was scored by two methods. First rankings were obtained by a round-robin tournament and correlated with individual scores. For the beginning group of male and female students the coefficient was .84. The intermediate group recorded a coefficient of

³⁸Jack E. Hewitt, "Classification Tests in Tennis," Research Quarterly, XXXIX (October, 1968), 552-555.

.93. The second method of validation used a larger population of male and female subjects with the Dyer Backboard Test serving as the criterion measure. For this group the coefficient was .80. Reliability was determined by the test-retest method and resulted in a coefficient of .90 for beginners and .86 for intermediates.³⁹

Digennario developed a battery of tennis skills tests in 1969. The three-item battery included the forehand drive test, the backhand drive test, and a serve test. For forehand and backhand drive tests, placement of the ball on the opposing court was a major concern. Concentric circles were used as placement targets with an added feature of a restraining rope across the net. Twenty strokes with three practice hits constituted one trial. Points were scored by those hits which passed over the net, yet under the restraining rope and into the proper zone. Reliability for the items was (1) serve test, .80; (2) forehand drive tests, .66; and (3) backhand drive test, .80. Validity coefficients were obtained using the rank-order method correlating rank, order, and stroke success percentage. The

³⁹Joann Kemp and Marilyn F. Vincent, "Kemp-Vincent Rally Test of Tennis Skill," Research Quarterly, XXXIX (December, 1968), 1000-1004.

validity results were (1) service test, .66; (2) forehand drive test, .40; and (3) backhand drive test, .78.⁴⁰

The above paragraphs discussed tennis skills, ability, or classification tests. The following part of this section will review handball skills tests for the purposes of classification, evaluation, and measurement of ability levels or progress.

Handball

A handball ability test was developed in 1938 by Clayton Cornish. The Cornish Handball Test consisted of a five-item battery. Included were: (1) a thirty-second volley, (2) a power drive test, (3) a back wall placement test, (4) a front wall placement test, and (5) a service test. After one week of instruction, the tests were administered to a group of 124 male students enrolled in beginning handball classes and once again ten weeks later. Validity was determined by correlating the total number of points scored minus those scored by an opponent while the subjects were participating in a tournament in which each subject played twenty-three games. The multiple correlation of the five tests with the subjects' score in the tournament

⁴⁰Joseph Digennario, "Construction of Forehand Drive, Backhand Drive and Service Tennis Tests," Research Quarterly, XXXX (October, 1969), 496-501.

was .69. The power test correlated the highest at .58. Reliability was not established.⁴¹

In 1967 Pennington and others constructed a handball test battery to measure handball ability. The test included a total of seventeen strength, motor ability, and handball skills. The following items were included:

- (1) 30-second wall volley
- (2) 30-second wall volley with the nondominant hand
- (3) total wall volley score
- (4) front-wall placement test total
- (5) front-wall placement with dominant hand
- (6) front-wall placement with nondominant hand
- (7) back-wall placement test total
- (8) back-wall placement test with dominant hand
- (9) back-wall placement test with nondominant hand
- (10) power test total
- (11) power test with dominant hand
- (12) power test with nondominant hand
- (13) service placement test
- (14) 30-second shuttle run
- (15) total grip strength
- (16) total grip strength with dominant hand
- (17) total grip strength with nondominant hand.

⁴¹Clayton Cornish, "A Study of Measurement of Ability in Handball," Research Quarterly, XX (May, 1949), 215-222.

The seventeen-item test was administered to thirty-seven male subjects. A partial round-robin tournament with the players' average per game times ten served as the criterion for correlation. A multiple correlation of .79 was reported for the service placement and total wall volley. The total wall volley and the service placement tests were chosen as the items of the test battery for predicting handball ability.⁴²

Tyson developed a handball skill test for college men in 1967. The test battery included seven items. Reliability was reported as .82 for the thirty-second volley, .82 for the front wall kill with dominant hand, .68 for the front wall kill with nondominant hand, .81 for the back wall kill with dominant hand, .60 for the back wall kill with nondominant hand, .73 for the ceiling shot with dominant hand, and .84 for the ceiling shot with nondominant hand. Validity for the test items was .87 for the thirty-second volley, .84 for the front wall kill with dominant hand, .75 for the front wall kill with nondominant hand, .76 for the backwall kill with dominant hand, .61 for the back wall kill with nondominant hand, .72 for the ceiling shot

⁴²G. Gary Pennington, James A. Day, John N. Drowatsky, and John F. Hanson, "A Measure of Handball Ability," Research Quarterly, XXXVIII (May, 1967), 247-253.

with dominant hand, and .69 for the ceiling shot with the nondominant hand.⁴³

In 1972 Millonzi constructed and validated a handball skill test for all levels of ability. He used twenty-three skill test items of which fifteen were found to have a reliability coefficient of .60 or better. When these items were correlated with the lower reliability items, a correlation of .93 was obtained making the final test battery valid to a high degree.⁴⁴

Sattler developed a test battery in 1973 for classifying beginning handball players according to ability. The test battery was administered to 102 male students enrolled in beginning handball classes. The following made up the test battery: (1) dominant overhand return, (2) nondominant overhand return, (3) dominant front wall kill placement, (4) nondominant front wall kill placement, (5) thirty-second alternate hand volley, (6) thirty-second dominant hand volley, (7) thirty-second nondominant hand volley, and (8) one minute continuous back wall volley. Correlation was obtained by a partial round-robin singles tournament score minus the opponent's score. A multiple

⁴³Kenneth W. Tyson, "A Handball Skill Test for College Men" (unpublished Master's thesis, The University of Texas, 1967), pp. 32-34.

⁴⁴Frank C. Millonzi, "The Development of a Handball Skills Test" (unpublished Master's thesis, University of Wisconsin at Lacrosse, 1972), pp. 30-31.

correlation of .92 was reported among the dominant overhand return, the one minute back wall volley, the thirty-second alternate hand volley, the nondominant front wall kill and dominant front wall kill placement test. A multiple correlation of .90 was revealed for the dominant overhand return, the nondominant overhand return, and the dominant front wall kill placement. The author suggested that handball players could be classified according to ability by the total scores on a five-item or three-item test battery.⁴⁵

This concludes the discussion of handball skills, ability or classification test. The final section will review squash racquets tests for classification purposes, measurement of ability, or evaluation purposes.

Squash Racquets

A skills test for squash racquets was designed in 1977 by Cahill. The skills test battery included the following: (1) a thirty-second rally, (2) a lob serve test to the right, (3) a lob serve test to the left, (4) a forehand alley test, (5) a backhand alley test, (6) a forehand cross-court test, (7) a backhand cross-court test, (8) a volley test, (9) a power test, and (10) an agility

⁴⁵Thomas P. Sattler, "The Development of an Instrument to Measure Handball Ability of Beginning Level Players in a Physical Education Class," Dissertation Abstracts International, XXXV (April, 1975), 6485-6486.

test. Reliability was determined by the intraclass correlation procedure. Reliability scores for the test items ranged from .60 to .90 for beginning players and from .48 to .95 for varsity players. Concurrent validity was based upon the Spearman rank-order correlation comparing the won-loss ranking in a round-robin tournament with the ranking based on test scores. The validity coefficients for the beginners ranged from a high of .76 for the thirty-second rally test to a low of .41 on the power test. The validity coefficients for the varsity players ranged from a high of .87 on the thirty-second rally test to a .01 on the agility test.⁴⁶

Chapter 2 included the following review of literature: (1) historical review of racquetball; (2) validation and development of racquetball ability, skills, achievement or classification tests; and (3) validation and development of related racquet sports skills, ability, achievement or classification tests which included handball, tennis, and squash racquets. This concludes the discussion of the review of literature.

⁴⁶Peter J. Cahill, "The Construction of a Skills Test for Squash Racquets" (unpublished Doctoral dissertation, Springfield College, 1977), pp. 61-69.

Chapter 3

METHODS AND PROCEDURES

The purpose of this chapter is to discuss the methods and procedures used in this study. Results of a pilot study, the selection of subjects, and data collection are included. Also, the methods to be utilized for the treatment of the data are presented.

PILOT STUDY

To familiarize the investigator with the methods and procedures involved in this study, a pilot study was conducted during the 1980 summer session at Middle Tennessee State University. The James-Lowell Racquetball Test, Form A: Knowledge (JLRBT, Form A), and Form B: Ability (JLRBT, Form B) (see Appendixes A and B, respectively), was administered to the racquetball activity classes. The subjects consisted of 10 male and 8 female college students whose ages ranged from 18 to 37 years.

During the test and retest periods, the JLRBT, Form A, was administered prior to the JLRBT, Form B. Care was taken to ensure the same testing conditions for the test and retest periods.

Administration of the pilot study resulted in improved procedures and methods of data collection, increased ease of administration, economy of time, accuracy of scoring, and training of research assistants. Data collected from Form B: Ability were tested for reliability and validity utilizing the Pearson product-moment correlation procedures. Reliability was determined by test-retest method resulting in a correlation of .87. Validity was established using the instructor's subjective ratings of the students as the criterion measure. Comparisons were made between the combined male and female subjects which indicated a .60 correlation.

The pilot study results led to the following changes and/or additions: (1) utilization of trained assistants for administration of Form B: Ability, (2) refinement of verbal instructions and visual demonstration, and (3) revision of the instructor's rating from a three point rating scale to a five point rating scale (see Appendix C). These changes were applied in the investigation.

SELECTION OF SUBJECTS

The subjects for the study were 180 male and female college students enrolled in eleven racquetball activity classes. Only students enrolled in the 1980 fall semester at Middle Tennessee State University were used. At the beginning of the semester, the investigator gave the

subjects a detailed explanation of the study and the procedures that would be followed. It was stressed to the students that their participation or non-participation would in no way affect the grade to be received in the course. Before taking part in the study all volunteers were asked to sign a consent form (see Appendix D).

DATA COLLECTION

All data collection occurred during the regular class periods. Testing sessions were conducted during the regularly scheduled class periods. The investigator was responsible for all verbal instruction, visual demonstrations, and training of research assistants. The five research assistants who helped with the study were physical education majors. Two assistants were assigned randomly to each racquetball class according to class schedule. They were responsible for scoring and timing of the JLRBT, Form B.

The subjects for this study were given two tests during the initial data collection period: (1) the JLRBT, Form A (see Appendix A), and (2) the JLRBT, Form B (see Appendix B).

Initial Data Collection Period
James-Lowell Racquetball
Test, Form A: Knowledge

During the second regularly scheduled class meeting of the fall semester, the JLRBT, Form A (see Appendix A), was administered to each racquetball activity class during the first ten minutes of the class period. The test was administered, scored, and recorded by the investigator.

Initial Data Collection Period
James-Lowell Racquetball
Test, Form B: Ability

Five research assistants were trained by the investigator to aid in administering the JLRBT, Form B. The investigator read the students a list of directions and rules for the test and then demonstrated the procedure to be followed. Any questions by the students were answered by the investigator. Prior to the testing, a ten by twelve foot rectangle located behind the short line was measured and marked with masking tape on the floor. (See Appendix E.) Also, on the front wall was a line measured and taped five feet above the floor (see Appendix E). After entering the court area, each subject was given three balls and a racquet; extra balls were available. Standing within the restraining rectangle, the subject started the test by dropping a ball, letting it hit the floor once, and then rallying it against the front wall as rapidly as possible for thirty seconds. Three thirty-second trials were given

to each subject. The first trial was a warm-up trial. Each ball striking the wall on or below the line on the front wall during the second and third trials was counted provided the subject had at least one foot in or on the rectangle and the ball immediately contacted the front wall after contact with the racquet. The final score was the sum of all legal hits of the second and third trials. The scores of the second and third trials were recorded as initial data.

Only two courts were used in testing the subjects. After the subjects had completed Form A and Form B testing, they were dismissed. Neither classmates nor visitors were allowed to observe the subjects being tested.

Retest Data Collection Period

During the regularly scheduled class period following the initial data collection period, two tests-- (1) the JLRBT, Form A (see Appendix A), and (2) the JLRBT, Form B (see Appendix B)--were readministered to the racquetball activity classes. Precautions were taken so that all directions, demonstrations, scoring, recording, and personnel were identical to the initial data collection period.

Retest--James-Lowell Racquetball
Test, Form A: Knowledge

During the next regularly scheduled class period following the initial data collection period, Form A (see Appendix A) was readministered to the racquetball activity classes. The test was readministered, scored, and recorded by the investigator.

Retest--James-Lowell Racquetball
Test, Form B: Ability

Immediately following the administration of Form A (see Appendix A), Form B (see Appendix B) was readministered under the same conditions which occurred during the initial data collection period. The same trained research assistants scored and timed the results.

The same precautions were taken in the retest collection of data that were used during the initial data collection period. The sum of the scores of the second and third trials was listed as retest data.

TREATMENT OF DATA

Validity

Hensley stated that the use of a timed test may not measure all components of racquetball skills; however, rallying ability captures the essence of the game of

racquetball.¹ Validity may be established utilizing several methods. Barrow and McGee reported that each method of establishing validity involves the comparison of the new test with other variables. Five methods or variables were suggested: (1) subjective ratings in which evaluation is based on a rating scale which defines the distinguishing points between ratings; (2) previously validated tests; (3) composite scores; (4) tournament standings; and (5) face validity.²

The criterion measure for this study was established by using instructor ratings of the subjects. Seven instructors of the eleven classes being tested subjectively evaluated his students on their individual overall racquetball ability according to the following scale as suggested by McCloy and Young (see Appendix C): 5--Excellent; 4--Good; 3--Average; 2--Poor; and 1--Very Poor.³ The ratings were obtained during the week of the data collection. The instructors rated their subjects during the initial data collection period.

¹Larry D. Hensley, Whitfield B. East, and Jim L. Stillwell, "A Racquetball Skills Test," Research Quarterly, 1 (January, 1979), 114-118.

²Harold M. Barrow and Rosemary McGee, A Practical Approach to Measurement in Physical Education (Philadelphia: Lea and Febiger, 1975), pp. 42-44.

³Charles H. McCloy and Norma D. Young, Tests and Measurements in Health and Physical Education (New York: Appleton-Century-Crofts, Inc., 1954), p. 40.

Statistical Analyses

The Statistical Package for Social Sciences (SPSS) computer program was used to analyze statistically the data. The computer program was designed to compute the following:

1. Item analysis of each item of the James-Lowell Racquetball Test, Form A: Knowledge.
2. Validity of Form B: Ability of the James-Lowell Racquetball Test by
 - (a) correlating combined male and female test scores determined by instructor's ratings;
 - (b) correlating female scores to scores determined by instructor's ratings; and
 - (c) correlating male scores to scores determined by instructor's ratings.
3. Summaries of statistics included:
 - (a) Standard deviations for instructor ratings of male, female, and combined subjects;
 - (b) Standard deviations for initial test scores of male, female, and combined subjects;
 - (c) Means for initial instructor ratings for male, female, and combined subjects; and
 - (d) Means for initial test scores of male, female, and combined subjects.
4. Reliability coefficients for the JLRBT, Form B.

Chapter 4

ANALYSES OF DATA

The major hypotheses tested in this investigation were as follow:

HO₁: The items included in the James-Lowell Racquetball Test, Form A: Knowledge (JLRBT, Form A), will not be valid measures of beginning racquetball knowledge.

HO₂: There will be a statistically significant difference between the initial instructor ratings and the initial test scores for all subjects combined and male subjects and female subjects separately on the James-Lowell Racquetball Test, Form B: Ability (JLRBT, Form B).

HO₃: There will be a statistically significant difference between the initial test scores and retest scores for all subjects combined and male subjects and female subjects separately on the JLRBT, Form B.

The following three sections show the results of (1) the item analyses, (2) the initial instructor ratings and initial test scores, and (3) the initial test scores and retest scores. The final section deals with the construction of norms for the JLRBT, Form B.

Hypothesis one dealt with the JLRBT, Form A. Hypotheses two and three dealt with the JLRBT, Form B, and were tested at the .01 level of significance utilizing the Pearson product-moment correlation coefficient.¹

RESULTS OF THE ITEM ANALYSES OF THE
JAMES-LOWELL RACQUETBALL TEST,
FORM A: KNOWLEDGE

Hypothesis one was tested by the standards set forth by the Flanagan Method as described by Scott and French.² Item analyses resulted in two measures for each item: (1) difficulty rating and (2) index of discrimination. Hypothesis one was stated so as to examine the discriminatory nature and difficulty implied of each item on the JLRBT, Form A. Within the item analysis each measure was computed for each item which allowed comparisons to be made. The difficulty ratings and indices of discrimination for each item of the JLRBT, Form A, are given in Table 1.

DIFFICULTY RATING

Difficulty rating limits were set previously between .90 and .10. Only two of the fifteen items (13.4%) were

¹Harold M. Barrow and Rosemary McGee, A Practical Approach to Measurement in Physical Education (Philadelphia: Lea and Febiger, 1975), pp. 98-102.

²Gladys M. Scott and Esther French, Measurement and Evaluation in Physical Education (Dubuque, Iowa: Wm. C. Brown Company, 1959), pp. 124-131.

Table 1
 Difficulty Ratings and Indices of Discrimination
 for Each Item of the JLRBT, Form A

Item	Difficulty Rating		Index of Discrimination
	Upper Limits .90	Lower Limits .10	
1	.19	.21 ^M	
2	.53	.54 ^H	
3	.66	.59 ^H	
4	.55	.43 ^H	
5	.47	.39 ^M	
6	.07*	.19 ^L	
7	.71	.22 ^M	
8	.93*	.19 ^L	
9	.74	.53 ^H	
10	.77	.42 ^H	
11	.12	.08 ^L	
12	.79	.32 ^M	
13	.29	.57 ^H	
14	.23	.42 ^H	
15	.43	.27 ^M	

*Items for revision

H--High (.41 and above)

M--Moderate (.21-.40)

L--Low (.01-.20)

considered for revision. Item six (DR = .07) was below the required limits and, therefore, considered too difficult; whereas, item eight (DR = .93) was above the required limits and was considered too easy. Difficulty ratings of the remaining thirteen (86.6%) were within the required limits (DR = .10 to .90) and were accepted as valid items for the knowledge test.

INDEX OF DISCRIMINATION

An index of discrimination was considered to be high if .41 and above was attained; moderate from .21 to .40; and low in discrimination from .01 to .20. Seven items, or 46.7% (Nos. 2, 3, 4, 9, 10, 13, 14) obtained a high index. Five items, or 33.3% (Nos. 1, 5, 7, 12, 15) attained a moderate index, and three items, or 20.0% (Nos. 6, 8, 11) attained a low index of discrimination. Examination of Table 2 provides a summary of the results of the difficulty ratings and index of discrimination.

On the basis of these results, Hypothesis one (that the items included in the JLRBT, Form A, will not be valid measures of beginning racquetball knowledge) was rejected. Thirteen of the fifteen items (86.6%) were accepted as valid items of the JLRBT, Form A. The two items that were not accepted as valid were not discarded but were recommended for revision.

Table 2

Summary Table for Difficulty Ratings and Index of
Discrimination

Legend: Standard: required per cent, f: frequency of items

<u>Difficulty Rating</u>	<u>Standard</u>	<u>f</u>	<u>%</u>
.90 to 1.00	5% or less	1	6.7
.10 to .89	90% or more	13	86.6
.00 to .09	5% or less	<u>1</u>	<u>6.7</u>
		15	100.0
<u>Index of Discrimination</u>			
.41 or above	25% or more	7	46.7
.21 to .40	25% or more	5	33.3
.01 to .20	15% or more	3	20.0
zero or negative	5% or less	<u>0</u>	<u>00.0</u>
		15	100.0

RESULTS OF INITIAL INSTRUCTOR RATINGS AND
INITIAL TEST SCORES FOR THE JAMES-
LOWELL RACQUETBALL TEST,
FORM B: ABILITY

Hypothesis two was stated so as to examine the correlation between initial test scores of subjects for the JLRBT, Form B, and initial instructor ratings of the subjects by the instructors of the specific class. The means and standard deviations for the initial instructor ratings and initial test scores for all subjects, male subjects, and female subjects are given in Table 3.

Table 3

Means and Standard Deviations for the Initial Instructor Ratings and Initial Test Scores for All Subjects, Male Subjects, and Female Subjects

Groups	Initial Instructor Rating		Initial Test Scores	
	\bar{X}	SD	\bar{X}	SD
All Subjects	2.5333	1.027	14.4637	7.5150
Male Subjects	2.9057	.9907	17.528	7.7216
Female Subjects	2.000	.8276	10.0137	4.3317

The mean score of the initial instructor ratings for all subjects was 2.5333, and the standard deviation was 1.027. The mean score of the initial instructor rating for male subjects was 2.9057, and the standard deviation was .9907. The mean score of the initial instructor rating for female subjects was 2.000, and the standard deviation was .8276.

The mean score of the initial test scores for all subjects was 14.4637, and the standard deviation was 7.515. The mean score of the initial test scores for male subjects was 17.528, and the standard deviation was 7.7216. The mean score of the initial test scores for female subjects was 10.0137, and the standard deviation was 4.3317.

The results of the correlation and t values for the initial instructor ratings and the initial test scores for

all subjects, male subjects, and female subjects are presented in Table 4.

Table 4

Results of Correlation and t Values for the Initial Instructor Rating and Initial Test Scores for All Subjects, Male Subjects, and Female Subjects

Group	N	Correlation (r)	t Value	df=N-2	.01 Level
All Subjects	180	.5932	9.804*	178	2.60
Male Subjects	106	.5021	5.099*	104	2.63
Female Subjects	74	.4625	4.95*	72	2.65

*Significant at .01 level

Examination of Table 4 shows the correlation coefficient (r) for all subjects, $r = .5932$; a t value of 9.804; and the number of subjects, $N = 180$. This correlational coefficient for male subjects was $r = .5021$; a t value of $t = 5.099$; and the number of male subjects was $N = 106$. The correlation of coefficient for female subjects was $r = .4625$; a t value of $t = 4.95$; and the number of female subjects was $N = 74$. These results indicate that there was a significant degree of agreement between the initial instructor ratings and the initial test scores at the .01 level of significance.

On the basis of these results, Hypothesis two (that there will be significant difference between the initial

instructor rating and the initial test scores of the subjects on the JLRBT, Form B), was rejected.

RESULTS OF INITIAL TEST SCORES AND RETEST
SCORES OF THE JAMES-LOWELL RACQUETBALL
TEST, FORM B: ABILITY

Hypothesis three was so stated as to examine the correlation between initial test scores of subjects and retest scores of subjects. All data collected are presented in Appendix F. For validity, coefficients are reported to indicate the relationship between the scores of the initial instructor ratings of all subjects combined and male and female subjects separately, and initial test scores for the subjects on the JLRBT, Form B. For reliability, coefficients were reported to indicate the relationship between the initial test scores and retest scores of all subjects combined and male and female subjects separately on the JLRBT, Form B.

The means and standard deviations for the initial test scores and retest scores for all subjects, male subjects, and female subjects are given in Table 5.

The mean score of the initial test scores for all subjects was 14.4637, and the standard deviation was 7.5150. The mean score of the initial test scores for male subjects was 17.5283, and the standard deviation was 7.7216. The mean score of the initial test scores for female subjects was 10.0137, and the standard deviation was 4.3317.

Table 5

Means and Standard Deviations for the Initial Test Scores and Retest Scores for All Subjects, Male Subjects, and Female Subjects

	Initial Test Scores		Retest Scores	
	\bar{X}	SD	\bar{X}	SD
All Subjects	14.4637	7.5150	17.2410	7.9179
Male Subjects	17.5283	7.7216	20.7732	7.6137
Female Subjects	10.0137	4.3317	12.2754	5.2409

The mean score of the retest scores for all subjects was 17.2410, and the standard deviation was 7.9179. The mean score of the retest scores for the male subjects was 20.7732, and the standard deviation was 7.6137. The mean score of the retest scores for the female subjects was 12.2754, and the standard deviation was 5.2409.

The results of the correlation of coefficients and t values for the initial test scores and the retest scores for all subjects, male subjects, and female subjects are presented in Table 6.

Examination of Table 6 shows the correlation coefficient (r) for all subjects, $r = .815$; a t value of $t = 17.95655$; and the number of all subjects was $N = 165$. The correlation coefficient (r) for male subjects was $r = .7759$; a t value of $t = 12.8208$; and the number of male subjects was $N = 97$. The correlation coefficient (r) for

Table 6

Results of Correlation and t Values of the Initial
Test Scores and the Retest Scores for All
Subjects, Male Subjects, and
Female Subjects

Group	N	Correlation (r)	t Value	df=N-2	.01 Level
All Subjects	165	.815	17.95655a*	163	2.61
Male Subjects	97	.7759	12.8208*	95	2.63
Female Subjects	68	.6596	7.039*	66	2.655

*Significant at .01 level

female subjects was $r = .6596$; a t value of $t = 7.039$; and the number of female subjects was $N = 68$. These results indicate that there was a significant degree of association between the initial test scores and the retest scores at the .01 level of significance.

On the basis of these results, Hypothesis three (that there will be significant difference between the initial test scores and retest scores for the subjects on the JLRBT, Form B) was rejected.

ACTIONS ON HYPOTHESES

On the basis of the preceding results, the following action was taken for each hypothesis:

Hypothesis 1. The items included in the JLRBT, Form A, will not be valid measures of beginning racquetball knowledge was rejected.

Hypothesis 2. There will be a statistically significant difference between the initial instructor ratings and the initial test scores for all subjects combined and male subjects and female subjects separately on the JLRBT, Form B, was rejected.

Hypothesis 3. There will be a statistical significant difference between the initial test scores and retest scores for all subjects combined and male subjects and female subjects was rejected.

CONSTRUCTION OF NORMS

Although the major purpose of this investigation was to examine the hypotheses, the investigator was also interested in the construction of norms for the JLRBT, Form B. From the data collected, norms were constructed utilizing the Sigma Scale.

The raw scores of the initial test scores were converted to a Sigma Scale for all subjects, male subjects, and female subjects. The converted scores and corresponding Sigma scores are given in Table 7.

Examination of Table 7 allows a subject to interpret individual standings as they compare to the total group (all subjects) or as they compare to subjects of their own sex. The conversion of raw scores to a scale allows the instructor

Table 7

Raw Scores with Corresponding Sigma Scores for All
Subjects, Male Subjects, and Female Subjects

Sigma Score	All Subjects	Male Subjects	Female Subjects
100	37	41	23
98	36	40	23
96	35	39	22
94	34	38	21
92	33	37	21
90	33	36	20
88	32	35	20
86	31	34	19
84	30	33	19
82	29	32	18
80	28	31	18
78	27	30	17
76	26	30	17
74	25	29	16
72	24	28	16
70	24	27	15
68	23	26	15
66	22	25	14
64	21	24	14
62	20	23	13
60	18	22	13
58	18	21	12
56	17	20	12
54	16	19	11
52	15	18	11
50	15*	18*	10*
48	14	17	10

Table 7 (Continued)

<u>Sigma Score</u>	<u>All Subjects</u>	<u>Male Subjects</u>	<u>Female Subjects</u>
46	13	16	9
44	12	15	8
42	11	14	8
40	10	13	7
38	9	12	7
36	8	11	6
34	7	10	6
32	6	9	5
30	6	8	5
28	5	7	4
26	4	7	4
24	3	6	3
22	2	5	3
20	1	4	2
18		3	2
16		2	1
14		1	
12			

*Mean

compare or average unlike data or to group or classify their students for instructional purposes.

Classification scales were devised for Form B. High, middle, and low ability levels were obtained by dividing the range scores and are given in Table 8.

Table 8
Ability Level Scale

Ability Level	All Subjects		Male Subjects		Female Subjects	
	Raw Score Range	Sigma Score Range	Raw Score Range	Sigma Score Range	Raw Score Range	Sigma Score Range
High	25 and up	74-100	25 and up	66-100	17 and up	76-100
Middle	13 to 24	46-72	13 to 24	40-100	9 to 16	46-74
Low	0 to 12	18-44	0 to 12	14-38	0 to 8	16-44

Chapter 5

CONCLUSIONS, OBSERVATIONS, AND RECOMMENDATIONS

The purpose of this study was to validate the JLRBT, Form A and Form B. Other results were the establishment of reliability and construction of norms for the JLRBT, Form B.

The population for the study was taken from eleven racquetball activity classes at Middle Tennessee State University in the fall, 1980, semester. A total of one hundred eighty subjects, ages seventeen to forty-eight, participated in the initial data collection period; one hundred sixty-five of the total were included in the retest data collection period. During the initial data collection period, the JLRBT, Form A, was administered prior to the JLRBT, Form B. While Form B was being administered, each regular class instructor rated his students as to their overall racquetball ability.

CONCLUSIONS

Based on the data collected and the results of the findings, the following conclusions were made:

1. Fifteen items were included on the JLRBT, Form A: Knowledge; thirteen (86.6%) were judged valid measures

of racquetball knowledge. Therefore, Form A is suitable for use as a means of classifying students into homogeneous groups according to racquetball knowledge (Hypothesis one).

2. Two items (13.4%) of the JLRBT, Form A: Knowledge, should be revised. Item 6 obtained a difficulty rating of $DR = .07$, which was below the required limits. Item 8 obtained a difficulty of $DR = .93$, which was above the required limits (Hypothesis one).

3. The initial instructor ratings obtained a positive correlation ($r = .59$) with the initial test scores of all subjects for the JLRBT, Form B: Ability. This correlation was significant at the .01 level. Therefore, Form B: Ability, is a valid means of classifying students of coeducational racquetball classes into homogeneous groups for purposes of instruction (Hypothesis two).

4. Male subjects obtained a mean score ($X = 17.53$) higher than the female subjects ($X = 10.0$). Therefore, the male subjects, as a group, scored higher on the JLRBT, Form B: Ability.

5. The initial instructor ratings obtained a positive correlation ($r = .50$) with the initial test scores of male subjects for the JLRBT, Form B: Ability. Though not as high as the correlation for all students combined, the obtained correlation was significant at the .01 level. Therefore, the JLRBT, Form B: Ability, is a valid means of

classifying male students into homogeneous groups for purposes of instruction (Hypothesis two).

6. The initial instructor ratings obtained a positive correlation ($r = .495$) with the initial test scores of female students for the JLRBT, Form B: Ability. Though not as high as the obtained correlation for all students combined or male students, the obtained correlation was significant at the .01 level. Therefore, the JLRBT, Form B: Ability, is a valid means of classifying female students into homogeneous groups for purposes of instruction (Hypothesis two).

7. The initial test scores of all subjects obtained a positive correlation ($r = .81$) with the retest scores of all subjects for the JLRBT, Form B: Ability. The obtained correlation was highly significant at the .001 level. Therefore, it is a reliable test of racquetball rallying ability (Hypothesis three).

8. The initial test scores of male subjects obtained a positive correlation ($r = .77$) with the retest scores of male subjects for the JLRBT, Form B: Ability. The obtained correlation was highly significant at the .001 level and, therefore, a reliable test of rallying ability for male subjects (Hypothesis three).

9. The initial test scores of female subjects obtained a positive correlation ($r = .6596$) with the retest scores of female subjects for the JLRBT, Form B: Ability.

The obtained correlation was significant at the .01 level and, therefore, a reliable test of rallying ability for female subjects (Hypothesis three).

OBSERVATIONS

During the course of this study and from the results, several observations made were:

1. Because the first day of a semester is, in many classes, spent as an orientation day, the investigator suggests this day to administer the JLRBT, Form A: Knowledge.

2. The JLRBT, Form A: Knowledge, is economical in time. Total time for administration, including verbal instructions, is approximately twelve minutes.

3. The JLRBT, Form B: Ability, is economical in time and personnel. The instructor can time, score, and rate his students with little or no help. Court markings took approximately twenty minutes to apply on the floor and wall. Materials were inexpensive.

4. Approximately three minutes per subject were required for the three trials of the JLRBT, Form B: Ability. Once the instructor had become familiar with the test, time per subject was reduced fifteen to twenty seconds. Further time can be saved if instructions are given to the subjects to retrieve the balls being used after each trial is completed.

5. Students who had previous experience in tennis seemed to have adapted to the rallying test more so than students who had not participated in previous racquet sports.

6. Male subjects seemed to be less apprehensive about participating in the ability test, while female subjects were the opposite. Male subjects may have had less apprehension because of a variety of reasons which could include previous playing experience, previous athletic participation, etc. Female subjects may have been more apprehensive because of a variety of reasons which could include low skill level, no previous experiences, lack of athletic participation, etc.

7. Immediate feedback to the students concerning their test scores on the JLRBT, Form B: Ability, would be advantageous. The JLRBT provides a suitable form (The James-Lowell Racquetball Test Profile Sheet--see Appendix B) for the recording of essential and informative material concerning the students' scores and abilities. It will also provide a record for the student as well as the instructor concerning beginning abilities and could serve as a guide for instructional strategies.

8. The instructors who obtained the highest correlations between their initial ratings of students and the students' initial test scores had not only had previous racquetball playing and teaching experience but also

handball playing and teaching experience. This seems to support the implication that handball is closely related to racquetball.

9. Out of seven classes in which the instructors were males, four male instructors' ratings obtained higher correlations with their male subjects' initial test scores than with female subjects' initial test scores. Two instructors obtained higher correlations with their female subjects' test scores. One instructor rated both approximately equal ($r = .4658$ to $r = .4682$).

Similar results occurred with the female instructors. Out of four classes in which the instructors were females, three female instructors' ratings obtained higher correlations with their female subjects' initial test scores than with male subjects' initial test scores. One instructor obtained a higher correlation with the male subjects.

RECOMMENDATIONS

In this study the evidence indicated that the James-Lowell Racquetball Test, Form A: Knowledge, and Form B: Ability, is a valid means of classifying coeducational racquetball classes into homogeneous groups for instructional purposes. Also, there was evidence that the JLRBT, Form B: Ability, was a reliable measure of

racquetball rallying ability. However, additional research on the findings of this study is needed. Specific recommendations are as follow:

1. The JLRBT, Form A: Knowledge, should be utilized in developing a course of study or adapted to present courses of study.

2. The JLRBT, Form A: Knowledge, should be utilized as a means of classification of students according to racquetball knowledge.

3. Attempts should be made to establish the reliability of the JLRBT, Form A: Knowledge.

4. Additional studies should be conducted by increasing the number of items on the JLRBT, Form A: Knowledge, to question the strengthening of validity and reliability.

5. The JLRBT, Form A, could be used to develop a pre- and posttest evaluation device.

6. Similar studies should be carried out on a larger population and different geographical location to determine if the results hold true for the JLRBT, Form A and Form B.

7. The JLRBT, Form B, could be utilized as a means of classification of students according to racquetball ability.

8. New research should occur utilizing different criteria measures to improve the validity and reliability coefficients of the JLRBT, Form B.

9. An instructional program should be developed utilizing the results of the JLRBT, Form B.

10. Research should be conducted to validate the JLRBT, Form B, as a predictor of racquetball playing ability.

11. The JLRBT, Form B, should be used to classify groups of other ages, junior high, senior high, and the post-college population.

APPENDIXES

APPENDIX A

THE JAMES-LOWELL RACQUETBALL TEST
FORM A: KNOWLEDGE

Description of the James-Lowell Racquetball Test, Form A.

The James-Lowell Racquetball Test, Form A, has been designed to classify coeducational racquetball service classes into beginning, intermediate or advanced knowledge levels. It consists of fifteen multiple choice items which can be administered prior to the James-Lowell Racquetball Test, Form B: Ability.

Form A: Knowledge: Answer Sheet

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)
6. (A) (B) (C) (D)
7. (A) (B) (C) (D)
8. (A) (B) (C) (D)
9. (A) (B) (C) (D)
10. (A) (B) (C) (D)
11. (A) (B) (C) (D)
12. (A) (B) (C) (D)
13. (A) (B) (C) (D)
14. (A) (B) (C) (D)
15. (A) (B) (C) (D)

Name _____

Class _____

Date _____

Directions:

Each question in this test is followed by four suggested answers. Read each question and then decide which one of the four suggested answers is best. Find the row of boxes on your answer sheet which has the same number as the question. In this row, mark the box having the same letter as the answer you have chosen.

EXAMPLE

Chicago is a (A) state. (B) city. (C) country.
(D) continent.

On the answer sheet mark your answer in the following manner:

(A) (B) (C) (D)

The correct answer to this question is lettered B, so box B is marked.

Go on to the next page, begin the test. Please mark your answers on the sheet that is provided. Please DO NOT mark on the test. As soon as you have finished return the test and answer sheet to the proper box.

THE JAMES-LOWELL RACQUETBALL TEST
FORM A: KNOWLEDGE

1. The man who is usually given credit for the development of a game which has become known as racquetball is:
(A) Joe Sobeck. (B) Earl Risky. (C) Bud Muehleison.
(D) John Campbell.

2. The game of racquetball may be played by:
 - (A) only one player at a time.
 - (B) two or three players at a time.
 - (C) two, three or four players at a time.
 - (D) only singles and doubles may be played.
3. A single game is won by the side that first scores:
 - (A) 21 points. (B) 11 points. (C) 15 points.
 - (D) 25 points.
4. The measurements of a regulation four-wall racquetball court are:
 - (A) 35 feet in length, 22 feet in width, and 15 feet in height.
 - (B) 42 feet in length, 15 feet in width, and 25 feet in height.
 - (C) 45 feet in length, 25 feet in width, and 18 feet in height.
 - (D) 40 feet in length, 20 feet in width, and 20 feet in height.
5. The official racquet will have a maximum head length and width of:
 - (A) 15 inches by 10 inches.
 - (B) 10 inches by 12 inches.
 - (C) 12 inches by 12 inches.
 - (D) 11 inches by 9 inches.
6. To receive an opponent's serve you must stand:
 - (A) anywhere behind the short line.
 - (B) at least six feet behind the service line.
 - (C) at least five feet behind the short line.
 - (D) anywhere on the court.
7. The advantage of using the continental grip is that:
 - (A) it is the easiest to learn.
 - (B) it allows you to hit all shots without changing grips.
 - (C) it allows you to hit the forehand shot from any position.
 - (D) it should be used only if you are left-handed.
8. If you have never played racquetball before, one of the biggest adjustments would be:
 - (A) getting accustomed to the court.
 - (B) learning the kill shot.
 - (C) finding the best partner.
 - (D) putting the proper amount of spin on the ball.

9. The most important stroke for you to learn is:
(A) backhand. (B) forehand. (C) volley. (D) overhead.
10. When delivering the serve, the most desirable stroke is the:
(A) backhand. (B) forehand. (C) volley. (D) lob.
11. The first serve that one should master should be:
(A) the power serve.
(B) the lob serve.
(C) the cross-court serve.
(D) the overhand serve.
12. In order to be a steady consistent player you must:
(A) strive to learn the most effective kill shot.
(B) strive to learn all of the basic shots.
(C) strive to become an offensive player and not rely on defense alone.
(D) strive to master the basic fundamentals and execute them properly.
13. During your partner's serve you should be:
(A) in the ready position directly behind your partner.
(B) standing up with your back to the center of the back wall.
(C) standing up with your back to the side wall inside the service box.
(D) in the ready position beside your partner inside the service box.
14. Which of the following action DOES NOT result in a loss of service? The answer is:
(A) any served ball that hits the server's partner on the fly on the rebound from the front wall while the server's partner is in the service box.
(B) bouncing the ball more than three times while in the service box.
(C) any served ball that strikes the server's partner, or ceiling, or floor, or side wall before striking the front wall.
(D) any attempt to strike the ball on the first bounce that results in a total miss or in touching any part of the server's body other than the racquet.
15. Which of the following is not a "dead ball" hinder? The answer is:
(A) any returned ball that touches an opponent on the fly before it returns to the front wall.
(B) any body contact with an opponent that interferes with seeing or returning the ball.

- (C) opponent moves in the way and is struck by the ball just played.
- (D) ball hits any part of the court which under local rules is a hinder.

APPENDIX B

THE JAMES-LOWELL RACQUETBALL TEST
FORM B: ABILITY

THE JAMES-LOWELL RACQUETBALL TEST
FORM B: ABILITY

Equipment Needed:

1. Regulation, four wall racquetball court
2. 2" masking tape, 22 yards
3. Ten regulation racquetballs with container for extra balls
4. Score sheets and pencils
5. A stopwatch

Description of the James-Lowell Racquetball Test, Form B.

The James-Lowell Racquetball Test, Form B, has been designed to classify coeducational racquetball service classes into beginning, intermediate, or advanced ability levels. It consists of a thirty-second front wall rally in which the subject may use any grip, stroke, and stance to strike the ball in such a way that it rebounds off the front wall. The subject's score will be the total number of hits that strike the front wall on or below a two-inch line, five feet above the floor and which are hit while the subject is in a ten foot by twelve foot rectangle marked on the court surface behind the short service line. The subject will have three thirty-second trials.

Directions to read to the subjects:

Stand within the rectangle (indicate the rectangle behind the short line) with three balls in your non-racquet hand. On the signal "Ready-Begin" strike the ball so that it hits the front wall on or below the five foot line (indicate line on front wall). As the ball rebounds, attempt to rally it against the front wall and on or below the marked line. After starting the ball you may hit it as it comes off the front or side wall either before it bounces

or after any number of bounces. Only those shots hit while at least one foot is within the rectangle, which hit on or below the five foot line, and which contact the front wall immediately after contact with the racquet, will be scored. You may go anywhere on the court to retrieve balls but any hits made from outside the rectangle or which strike the side wall, floor, or ceiling before hitting the front wall will not count. Try to keep the ball going but if you lose control of a ball or miss it do not attempt to recover it. Start a new ball by striking it as you did the first one. Your first trial is over when I say "stop" at the end of thirty seconds. Your score is the sum of the last two trials.

Scoring:

The number of hits against the front wall on or below the five foot line, while staying inside the ten by twelve foot rectangle in thirty seconds, is the score for each trial. The total of the last two trials will be the subject's score.

The James-Lowell Racquetball Profile Sheet Date _____

Name: _____ Sex M F Age _____ Semester _____

Classification: Fr__ Soph__ Jr__ Sr__ Other _____

Right-handed _____ Left-handed _____

Self-rating: Beginner__ Intermediate__ Advanced__

Instructor's Rating: Beginner__ Intermediate__ Advanced__

Form A: Knowledge Score _____

Form B: Ability Total Score _____

Instructor's Rating Score Sheet:

To be scored on the first thirty-second trial

	Good	Average	Poor	Instructor comments
Grip	3	2	1	
Stance	3	2	1	
Starting Position	3	2	1	
Forehand Stroke	3	2	1	
Forehand Follow-through	3	2	1	
Backhand Stroke	3	2	1	
Backhand Follow-through	3	2	1	
Footwork	3	2	1	

Form B: Ability

2nd 30-second Trial Score _____ points

3rd 30-second Trial Score _____ points

Total _____ points

Summary

Instructor's Rating total points _____ Class Rank _____

Form A: Knowledge _____ Intermediate Group:

Beginner _____

Form B: Ability _____ Intermediate _____

Advanced _____

APPENDIX C

RACQUETBALL INSTRUCTOR'S RATING SHEET

Directions:

In a beginning coeducational racquetball activity class, evaluation is an immediate concern not only for the instructors but also for their students. Based upon observation and experience, rate each student's overall racquetball ability. Please use the following rating system.

5--Excellent: Correct grip is used. Correct stance is used when serving and stroking the ball. Correct form is used in forehand, backhand, and overhand strokes. Correct footwork is exhibited.

4--Good: Correct grip is used. Correct stance is used for serving and for majority of strokes. Correct form is used for forehand stroke, may have a weak backhand and overhead stroke. Correct footwork is usually exhibited.

3--Average: Correct grip may be used. Correct stance is generally used for serving, but inconsistent during stroking the ball. Correct form is used for majority of forehand strokes, rarely used for backhand or overhead strokes. Correct footwork is inconsistent.

2--Poor: Correct grip may be used. Correct stance may be used for serving, but rarely correct for stroking the ball. Correct form is rarely used during forehand, backhand, or overhead strokes. Correct footwork is rarely used.

1--Very Poor: Correct grip is never used. Correct stance is never used for serving or stroking the ball.

Correct form is never used during forehand, backhand, or overhead strokes. Correct footwork is never used.

Instructor _____ Class _____ Date _____

Student's Name Student's Rating--Please circle one rating.

		Excellent	Good	Average	Poor	Very Poor
1.	_____	5	4	3	2	1
2.	_____	5	4	3	2	1
3.	_____	5	4	3	2	1
4.	_____	5	4	3	2	1
5.	_____	5	4	3	2	1
6.	_____	5	4	3	2	1
7.	_____	5	4	3	2	1
8.	_____	5	4	3	2	1
9.	_____	5	4	3	2	1
10.	_____	5	4	3	2	1
11.	_____	5	4	3	2	1
12.	_____	5	4	3	2	1
13.	_____	5	4	3	2	1
14.	_____	5	4	3	2	1
15.	_____	5	4	3	2	1
16.	_____	5	4	3	2	1
17.	_____	5	4	3	2	1
18.	_____	5	4	3	2	1
19.	_____	5	4	3	2	1
20.	_____	5	4	3	2	1

APPENDIX D

THE JAMES-LOWELL RACQUETBALL TEST
CONSENT FOR TEST PARTICIPATION

THE JAMES-LOWELL RACQUETBALL TEST
 CONSENT FOR TEST PARTICIPATION

The James-Lowell Racquetball Test, Form A: Knowledge, and
 Form B: Ability.

James Shemwell, Director of Testing Date _____
 Class Instructor _____
 Test Location: Murphy Center

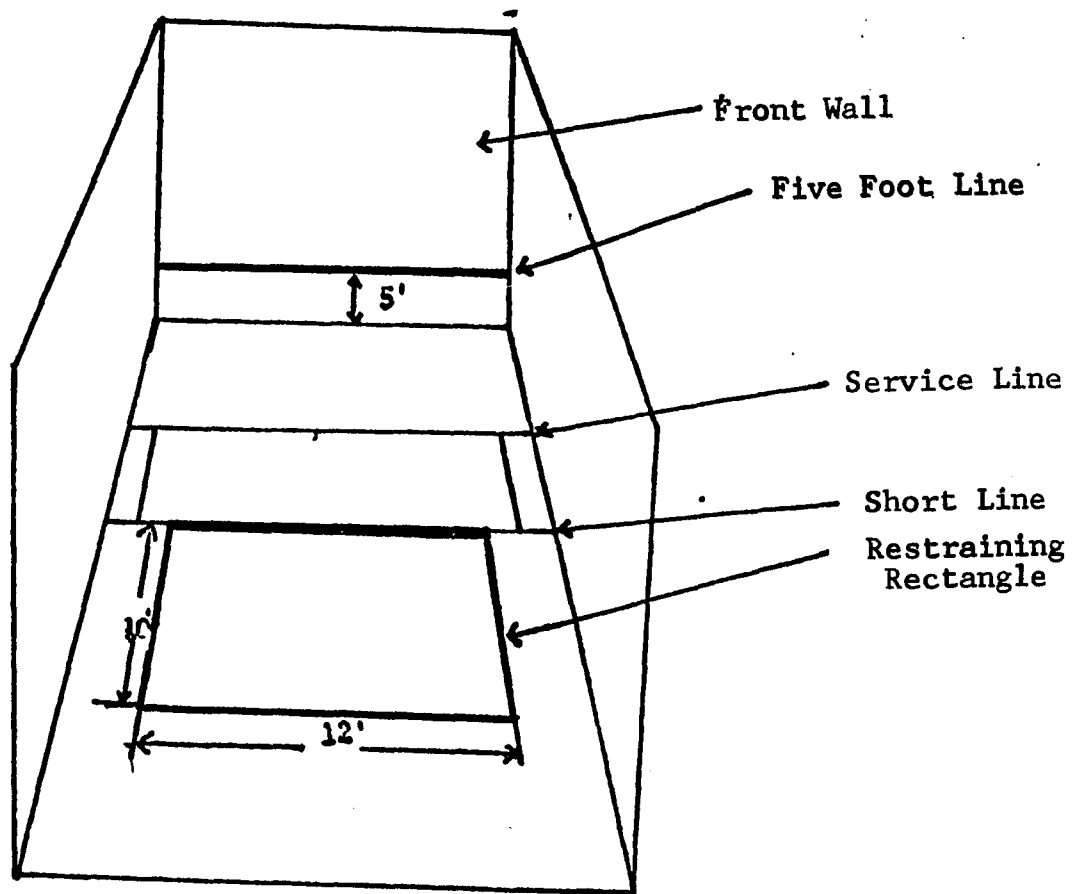
I, _____, hereby agree to
 Subject's Name
 participate in an experimental test under the supervision
 of James Shemwell. I understand that the results of the
 test will in no way affect my grade. I am _____ years of
 age. I am a male female (circle one). My classification
 is FROSH. SOPH. JR. SR. (circle one).

 Volunteer's Signature

Date _____

APPENDIX E

COURT DIAGRAM



COURT DIAGRAM WITH MARKINGS FOR JAMES-LOWELL RACQUETBALL
TEST, FORM B: ABILITY.

APPENDIX F

RAW DATA: JAMES-LOWELL RACQUETBALL
TEST FORM A: KNOWLEDGE, FORM B:
ABILITY, AND INITIAL TEST
SCORES CONVERTED INTO
SIGMA SCORES

FORM A

SN	NCA	SN	NCA	SN	NCA	SN	NCA	SN	NCA	SN	NCA
001	6	031	3	061	7	091	7	121	5	151	8
002	3	032	9	062	7	092	4	122	7	152	8
003	8	033	13	063	5	093	10	123	7	153	8
004	9	034	9	064	8	094	6	124	6	154	6
005	9	035	5	065	7	095	6	125	8	155	8
006	8	036	8	066	8	096	9	126	9	156	8
007	5	037	8	067	6	097	6	127	11	157	6
008	5	038	8	068	7	098	6	128	9	158	4
009	4	039	10	069	8	099	5	129	12	159	8
010	7	040	5	070	9	100	6	130	7	160	7
011	7	041	10	071	6	101	9	131	4	161	6
012	9	042	10	072	7	102	4	132	11	162	7
013	10	043	6	073	7	103	9	133	6	163	11
014	7	044	10	074	6	104	8	134	7	164	5
015	4	045	11	075	12	105	10	135	6	165	12
016	4	046	10	076	9	106	6	136	7	166	10
017	8	047	8	077	7	107	6	137	8	167	7
018	7	048	10	078	6	108	5	138	8	168	11
019	11	049	10	079	12	109	9	139	6	169	4
020	2	050	8	080	8	110	7	140	10	170	7
021	6	051	8	081	7	111	10	141	7	171	6
022	6	052	9	082	6	112	10	142	7	172	6
023	3	053	8	083	6	113	6	143	8	173	6
024	7	054	10	084	4	114	8	144	7	174	8
025	6	055	7	085	6	115	11	145	4	175	10
026	8	056	8	086	8	116	9	146	4	176	8
027	2	057	11	087	3	117	6	147	9	177	8
028	6	058	7	088	4	118	8	148	6	178	8
029	6	059	9	089	10	119	4	149	6	179	4
030	5	060	4	090	6	120	6	150	6	180	5

SN--Subject Number

NCA--Number of Correct Answers

FORM B

Subj. #	Sex	IRI	ITS	IR2	RTS	Subj. #	Sex	IRI	ITS	IR2	RTS
001	M	3	6	3	16	033	M	3	26	3	21
002	F	2	7	2	11	034	M	3	19	2	18
003	M	3	10	3	16	035	M	1	7	1	17
004	M	3	14	2	19	036	F	3	16	2	21
005	M	4	33	0	0	037	F	2	11	1	15
006	F	2	8	2	7	038	M	2	25	1	24
007	F	2	7	2	10	039	M	2	17	1	20
008	F	2	10	3	10	040	F	1	3	1	10
009	F	3	10	3	11	041	M	1	19	1	15
010	F	3	9	3	15	042	F	1	8	1	12
011	M	3	16	4	34	043	F	1	5	0	0
012	M	3	13	3	12	044	M	1	17	2	26
013	M	4	32	4	31	045	M	1	20	20	20
014	M	3	17	4	29	046	M	1	10	3	19
015	M	3	10	3	12	047	M	2	11	3	10
016	M	3	9	0	0	048	M	1	7	1	10
017	M	3	21	3	12	049	M	1	30	2	30
018	M	3	20	3	18	050	M	3	25	0	0
019	M	5	34	4	28	051	M	4	15	4	18
020	F	3	9	3	20	052	M	3	22	3	31
021	M	2	11	2	12	053	M	3	20	3	23
022	M	3	14	4	26	054	M	4	30	4	28
023	M	3	12	3	19	055	F	2	8	3	21
024	F	3	14	3	15	056	F	2	7	0	0
025	F	2	7	2	5	057	M	4	32	11	37
026	M	2	5	2	6	058	M	4	24	11	33
027	F	2	8	2	8	059	M	5	21	4	32
028	F	2	7	3	9	060	F	3	22	3	25
029	M	4	17	3	25	061	F	1	5	2	7
030	M	4	38	5	37	062	F	2	16	3	14
031	M	3	11	3	12	063	M	3	22	3	21
032	M	3	14	3	21	064	M	4	26	4	33

FORM B (Continued)

Subj. #	Sex	IRI	ITS	IR2	RTS	Subj. #	Sex	IRI	ITS	IR2	RTS
065	F	2	5	2	11	099	M	2	15	3	15
066	F	2	11	3	13	100	M	3	16	3	18
067	M	3	16	3	25	101	M	4	22	3	29
068	M	2	2	0	0	102	M	2	8	3	13
069	M	4	22	4	31	103	F	2	6	3	5
070	M	3	25	3	24	104	F	2	11	3	12
071	F	4	11	4	23	105	F	2	12	3	11
072	F	1	5	1	8	106	M	2	8	2	7
073	M	3	17	3	13	107	M	4	31	4	22
074	M	3	14	3	22	108	F	2	10	3	11
075	M	3	22	3	27	109	M	4	25	4	30
076	F	1	9	1	8	110	M	3	12	3	14
077	M	3	6	3	12	111	M	4	26	3	22
078	F	3	18	3	17	112	M	3	25	4	27
079	M	3	20	3	20	113	M	2	22	0	0
080	M	2	21	3	25	114	M	2	8	0	0
081	M	3	23	0	0	115	M	4	0	10	0
082	M	3	9	3	16	116	F	3	14	3	20
083	F	2	4	2	5	117	F	1	12	1	6
084	M	3	23	3	22	118	M	4	13	4	22
085	F	1	10	2	14	119	M	1	8	1	8
086	M	3	20	3	21	120	M	2	8	2	11
087	M	2	5	2	15	121	M	2	7	2	13
088	M	4	22	3	20	122	F	1	8	1	10
089	M	3	18	3	16	123	M	4	15	4	25
090	M	3	12	3	15	124	M	5	25	5	23
091	M	2	20	3	22	125	F	1	13	1	16
092	F	3	13	3	20	126	M	4	33	4	35
093	M	3	12	4	17	127	M	4	21	4	21
094	M	2	11	3	16	128	F	1	10	1	14
095	M	3	16	4	17	129	M	3	11	3	15
096	F	2	7	2	13	130	F	1	7	1	6
097	M	3	15	3	15	131	F	2	11	2	11
098	F	3	12	3	14	132	M	4	12	4	24

FORM B (Continued)

Subj. #	Sex	IRI	ITS	IR2	RTS	Subj. #	Sex	IRI	ITS	IR2	RTS
133	F	3	2	3	8	158	F	3	7	3	16
134	F	2	13	2	10	159	F	1	7	3	12
135	F	3	14	3	16	160	M	4	14	4	15
136	M	4	16	4	29	161	F	3	7	3	13
137	M	5	32	5	31	162	F	2	11	2	12
138	M	3	15	3	19	163	F	4	12	4	19
139	F	2	7	2	11	164	M	2	7	3	12
140	F	2	10	2	11	165	M	2	25	3	29
141	F	3	9	3	11	166	M	1	12	3	19
142	F	2	14	2	18	167	F	2	12	0	0
143	F	4	19	4	16	168	F	2	12	2	18
144	F	1	1	1	4	169	M	3	21	4	17
145	M	4	17	4	18	170	F	1	12	2	10
146	F	1	13	1	11	171	F	2	11	2	8
147	M	3	17	3	21	172	F	2	15	3	19
148	F	1	0	2	3	173	F	1	10	0	0
149	F	2	6	3	10	174	M	1	9	1	8
150	M	3	19	4	33	175	M	3	32	4	39
151	M	3	14	0	0	176	F	1	11	3	12
152	F	2	6	3	2	177	F	1	8	1	3
153	M	1	10	3	8	178	F	1	8	2	13
154	M	2	8	4	14	179	M	3	26	3	27
155	F	2	19	2	26	180	F	2	9	0	0
156	F	1	3	2	10						
157	F	1	7	3	12						

IRI--Instructor Rating Initial Test
 IR2--Instructor Rating Retest

ITS--Initial Test Score
 RTS--Retest Score

RAW DATA: INITIAL TEST SCORES CONVERTED INTO SIGMA SCORES

Sigma	All Subjects	Male	Female	Sigma	All Subjects	Male	Female
100	37.00	40.5	23	75	25.75	29.0	16.5
99	36.55	40.04	22.74	74	25.3	28.54	16.24
98	36.1	39.58	22.48	73	24.85	28.08	15.98
97	36.65	39.12	22.22	72	24.4	27.62	15.72
96	35.2	38.66	21.96	71	23.95	27.16	15.46
95	34.75	38.2	21.7	70	23.5	26.7	15.2
94	34.3	37.74	21.44	69	23.05	26.24	14.94
93	33.85	37.28	21.18	68	22.6	25.78	14.68
92	33.4	36.82	20.92	67	22.15	25.32	14.42
91	32.95	36.36	20.66	66	21.7	24.86	14.16
90	32.5	35.9	20.4	65	21.25	24.4	13.9
89	32.05	35.22	20.14	64	20.8	23.94	13.64
88	31.6	34.98	19.88	63	20.35	23.48	13.38
87	31.15	34.52	19.62	62	19.9	23.02	13.12
86	30.7	34.06	19.36	61	19.45	22.56	12.86
85	30.25	33.6	19.1	60	19.0	22.1	12.6
84	29.8	33.14	18.84	59	18.55	21.64	12.34
83	29.35	32.68	18.58	58	18.1	21.18	12.08
82	28.9	32.2	18.32	57	17.65	20.72	11.82
81	28.45	31.76	18.06	56	17.2	20.26	11.56
80	28.0	31.3	17.8	55	16.75	19.8	11.3
79	27.55	30.8	17.54	54	16.3	19.34	11.04
78	27.1	30.38	17.28	53	15.85	18.88	10.78
77	26.65	29.92	17.02	52	15.4	18.42	10.52
76	26.2	29.46	16.76	51	14.95	17.96	10.26

Sigma	All Subjects	Male	Female	Sigma	All Subjects	Male	Female
50	14.5	17.5	10.0	25	3.25	6.0	3.5
49	14.05	17.04	9.74	24	2.80	5.54	3.24
48	13.6	16.58	9.48	23	2.35	5.08	2.98
47	13.15	16.12	9.22	22	1.9	4.6	2.72
46	12.7	15.66	8.96	21	1.45	4.16	2.46
45	12.25	15.20	8.7	20	1.00	3.7	2.2
44	11.8	14.74	8.44	19		3.24	1.94
43	11.35	14.28	8.18	18		2.78	1.68
42	10.9	13.82	7.92	17		2.32	1.42
41	10.45	13.36	7.66	16		1.86	1.16
40	10.0	12.9	7.40	15		1.4	.90
39	9.55	12.44	7.14	14		.94	
38	9.1	11.98	6.88	13			
37	8.65	11.52	6.62	12			
36	8.20	11.06	6.36	11			
35	7.75	10.60	6.10	10			
34	7.30	10.14	5.84	9			
33	6.85	9.68	5.58	8			
32	6.4	9.22	5.32	7			
31	5.95	8.76	5.06	6			
30	5.50	8.30	4.80	5			
29	5.05	7.84	4.54	4			
28	4.60	7.38	4.28	3			
27	4.15	6.92	4.02	2			
26	3.70	6.46	3.76	1			

APPENDIX G
COMPOSITE SCORE SHEET

THE JAMES-LOWELL RACQUETBALL TEST
COMPOSITE SCORE SHEET

Instructor _____ Class _____

Class Subject Code No.	Subject Name	Instructor Rating		Initial Data Collection Score	Retest Data Collection Score
		1	2		
01	_____	_____	_____	_____	_____
02	_____	_____	_____	_____	_____
03	_____	_____	_____	_____	_____
04	_____	_____	_____	_____	_____
05	_____	_____	_____	_____	_____
06	_____	_____	_____	_____	_____
07	_____	_____	_____	_____	_____
08	_____	_____	_____	_____	_____
09	_____	_____	_____	_____	_____
10	_____	_____	_____	_____	_____
11	_____	_____	_____	_____	_____
12	_____	_____	_____	_____	_____
13	_____	_____	_____	_____	_____
14	_____	_____	_____	_____	_____
15	_____	_____	_____	_____	_____
16	_____	_____	_____	_____	_____
17	_____	_____	_____	_____	_____
18	_____	_____	_____	_____	_____
19	_____	_____	_____	_____	_____
20	_____	_____	_____	_____	_____

APPENDIX H

JLRBT, FORM B, SCORE SHEET

THE JAMES-LOWELL RACQUETBALL TEST: FORM B
SCORE SHEET

Date ___/___/___ Class _____

Instructor _____ Scorer _____

ODD Subject Code Name	1st Trial Warmup	2nd Trial Score	3rd Trial Score	EVEN Subject Code Name	1st Trial Warmup	2nd Trial Score	3rd Trial Score
01 _____				02 _____			
03 _____				04 _____			
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