The University of North Carolina
at Greensboro

JACKSON LIBRARY

CQ

no. 1424

UNIVERSITY ARCHIVES

KAUTZ, ELIZABETH MARIE. The Construction of a Volleyball Skill Test for the Forearm Pass. (1976) Directed by: Dr. Gail Hennis. Pp. 64

It was the purpose of this study to construct a valid and reliable skill test for the forearm pass for use with high school girls. The test was designed to measure only the forearm pass and not overall playing ability.

One hundred girls from Ragsdale High School in Jamestown, North Carolina participated in the investigation. All subjects were between the ages of fifteen and eighteen and were assumed to be of beginner and/or intermediate skill level in volleyball.

Four trials of the constructed test were administered to the one hundred subjects. A panel of five judges rated the subjects on their ability to execute the forearm pass in a game situation. Correlation coefficients were used to determine the objectivity of the judges' ratings. The odd - even method was used when comparing test trial scores to determine test reliability. Test validity was determined by statistically comparing the judges' ratings with the skill test scores. The Pearson Product Moment method for determining correlation coefficients was used for all comparisons. Evidence indicated that the judges were uniform and consistent in their rating of the subjects' playing ability. Objectivity coefficients ranged from .885 to .967. Evidence also indicated that the constructed skill test was a reliable and valid measure when used within the limitations of this study. A reliability coefficient of .82 was obtained for two trials and a figure of .90 was predicted by applying the Spearman-Brown Prophecy formula for double the number or four trials. Validity was tested

in four different ways. The total of five judges' ratings were compared to: (1) the single best score of the four trials, (2) the total of the best three scores of the four test trials, (3) the total of the four test trial scores, and (4) the average of the four test trial scores. The figures obtained were: .76 for single best trial, .79 for the three best scores, .79 for the total of the four trials, and .82 for the average of the four test trial scores.

Within the boundaries and scope of this study, it is concluded that the constructed skill test for the forearm pass is both a reliable and valid measure when used with high school girls of the beginner and/or intermediate level of volleyball skill.

THE CONSTRUCTION OF A VOLLEYBALL SKILL TEST FOR THE FOREARM PASS

by

Elizabeth Marie Kautz
III

A Thesis Submitted to
the Faculty of the Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Master of Science in Physical Education

Greensboro
1976

Approved by

Gaie M. Hennis
Thesis Adviser

APPROVAL PAGE

This thesis has been approved by the following committee of the Faculty of the Graduate School at the University of North Carolina at Greensboro.

Thesis Adviser Jane M. Stevens

Committee Members

Kate R. Barrett

April 19, 1976
Date of Acceptance by Committee

ACKNOWLEDGEMENTS

The writer wishes to express gratitude to her Adviser, Dr. Gail Hennis, for her assistance and guidance in the pursuit of this investigation.

To the judges and students of Ragsdale High School, the writer expresses appreciation for their help in making this study possible.

To the friends who showed interest and gave support throughout the entire graduate program, the writer expresses her deepest appreciation.

TABLE OF CONTENTS

	Page
APPROVAL PAGE	ii
ACKNOWLEDGEMENTS	iii
LIST OF TABLES	vi
LIST OF FIGURES	vii
CHAPTER	
I. INTRODUCTION	1
STATEMENT OF PROBLEM	3
DEFINITION OF TERMS	3
ASSUMPTIONS	4
SCOPE OF STUDY	4
SIGNIFICANCE OF STUDY	5
LIMITATIONS OF STUDY	6
SUMMARY	6
II. REVIEW OF LITERATURE	8
DEVELOPMENT OF FOREARM PASS	8
SKILL TESTS FOR FOREARM PASS	9
SUMMARY	16
III. PROCEDURE	17
TESTING PROCEDURES	17
Assumptions for Test Formulation	17
Description of Test	18
Selection of a Rating Scale	21
Selection of Subjects	22
Selection of Judges	23
Training of the Judges	24
Administration of Test	25
Judges' Rating of Subjects	26
TABULATION AND TREATMENT OF DATA	27
SUMMARY	28

503624

CHAPTER Page

IV. ANALYSIS AND INTERPRETATION OF DATA. 30

Objectivity of Judges. 31
Reliability of Constructed Test. 34
Validity of Constructed Test 35

SUMMARY. 37

V. SUMMARY AND CONCLUSIONS. 40

CONCLUSION 44
RECOMMENDATIONS. 44

BIBLIOGRAPHY 46

APPENDIXES 52

APPENDIX A Diagram of Testing Station. 53
APPENDIX B Diagram of Score Card 55
APPENDIX C Suttinger's Rating Scale. 57
APPENDIX D Judges' Rating Sheet. 59
APPENDIX E Raw Data. 61

LIST OF TABLES

TABLE Page

I. Objectivity Coefficients Obtained from the Seven Judges. 33

II. Reliability Coefficients for Wall Volley Bump Pass Test. 35

III. Validity Coefficients for Wall Volley Bump Pass Test. 37

LIST OF FIGURES

FIGURE Page

1. Diagram of Wall Test Target. 19

CHAPTER I

INTRODUCTION

Volleyball was invented in 1895 by William Morgan. First called "Mintonette," the purpose of the game was to provide competition and recreation for middle aged businessmen at the Young Men's Christian Association in Holyoke, Massachusetts. In 1896 Morgan took his game to Springfield for a demonstration at a convention for YMCA physical directors. It was at this convention that Professor Alfred T. Halstaed of Springfield College named the game "volleyball." (37:144)

In the 1916 Volleyball Guide, Robert C. Cubbon estimated that 200,000 persons in schools, playgrounds and clubs in the United States were playing volleyball. A major impetus for volleyball came in 1928 through the cooperative efforts of the National Collegiate Athletic Association and the Young Men's Christian Association culminating in the organization of the United States Volleyball Association. (37:145) The USVBA has been a most active supporter of the sport of volleyball at all levels. Volleyball now has an international association, the International Federation of Volleyball (FIVB), for coordinating the 107 countries presently involved in competition. Since 1916 and the estimate of 200,000, participants have increased until it is estimated that there are 40 to 60 million Americans who are now or have participated in the game of volleyball. (37:144)

Since the performance of the Japanese team in the 1964 Olympics, volleyball has progressed from a recreational game to a sport exhibiting an intense combination of both offensive and defensive strategy. (21:3) The emphasis on skill techniques, recent rule changes and interpretations, especially on contacting the ball, have brought about a style of play unknown to the game's originator. The changes in the rules required a hit that was clean and clear; one that would not permit the ball to come to rest on the hands or arms even for a moment. (7:6) The player in the receiving position cannot allow the ball to come to rest or make double contact with the ball. Because of the rules, recent participants in the game of volleyball have resorted to a method of hitting the ball called the underhand "bump" pass or forearm pass, especially in receiving the serve. (26:3) The forearm pass was first seen in the late 1940's as a desperation type of play, but it is now rated by many authorities as the most important fundamental skill in volleyball. In international competition it is used well over 50 percent of the time for ball reception. (51:37) Plunket says, "the pass is the key to offensive strategy." (46:37)

The writer, while not attempting to de-emphasize the other aspects of successful volleyball, wishes to emphasize that the proper execution of the bump is necessary for beginners and intermediates to minimize the chances of illegal hitting on serve receptions, other high velocity balls and low hits. For the advanced or skilled player, the bump is the initiation of an

offense requiring a bump-set-spike sequence. The emergence of this type of contact called the forearm pass, and its importance in the game of volleyball, brings about the need to objectively measure the ability to perform this skill. If the fundamental skill is to be taught and executed, then reliable and valid means for evaluation should also be available.

STATEMENT OF PROBLEM

It was the purpose of this study to construct a volleyball skill test designed to measure the forearm passing ability of high school girls. The investigator proposed to include the variables of ball control (by using repeated volleys), ball reception, height, distance and accuracy into a single evaluation. To date there is no known skill test that includes all of these aspects of the forearm pass. It was also the purpose of this study to determine if the constructed test was a reliable and valid measure for players at the beginning and/or intermediate levels of skill.

DEFINITION OF TERMS

The following operational definitions are used for this study:

1. Forearm pass or bump - method of contacting the ball below chest using both arms with the hands clasped together.

2. Modern or power volleyball - the game as it is played utilizing the latest techniques and adhering to the most recent rules.
3. Overhead pass or set - method of contacting the ball above chest height using the fingers of both hands.
4. Skill - a particular developed ability or accomplishment.

ASSUMPTIONS

The forearm pass is a vital aspect of both offensive and defensive play in the modern game of volleyball. To date there have been few tests specifically designed to measure this passing ability. One way to develop proficiency in this technique is to use the wall to pass to and to receive from. Wall tests have been used successfully to measure ability in the overhead pass, and it was the opinion of the investigator that a wall test could be constructed to evaluate the ability to perform the bump pass.

SCOPE OF STUDY

This test was designed to measure the forearm passing ability of high school girls. The one hundred subjects had completed required general physical education classes at Ragsdale High School in Jamestown, North Carolina. All subjects were between the ages of fifteen and eighteen. The investigator speculated that the constructed test would be a better measure of passing ability for beginners and those of intermediate skill than more highly skilled players. Well skilled players would

need to place the ball in an arc to a setter so that the spike could be performed. In general physical education classes, the spike is introduced but rarely perfected. The purpose of the forearm pass in this study was: ball control, service reception, passing the ball in the area of a setter and passing the ball over the net with a legal hit. The dimensions and requirements of the test were empirically designed, based upon observations such as: high percentage areas of the court where serve receptions occur, height and distance of the pass necessary to reach or to clear the net, body positioning required to receive balls from varying angles and accuracy of the pass towards the center of the net.

SIGNIFICANCE OF STUDY

Volleyball encompasses four major striking skills: the serve, the pass, the set and the spike. Previous evaluation of volleyball skill was based on the ability of a student to be able to serve and to use the set up. With the changes in rules, interpretations and game style, there is a need for a measuring device to test one of the most important contacts with the ball; the forearm pass or as it is commonly called, the bump. Both offensive and defensive play employ this type of pass. To date there have been very few skill tests designed to measure this skill. The writer has attempted to construct a test that will incorporate the variables of height, distance, accuracy and ball control that are necessary for successful execution of this pass in a game

situation. Wall tests have been successful when measuring the ability to perform the overhead pass or set and the investigator holds the opinion that a wall test can be employed to evaluate the bump pass.

LIMITATIONS OF STUDY

The investigation was subject to the following limitations:

1. The subjects for this study were limited to one hundred high school girls between the ages of fifteen and eighteen who had completed at least one unit of volleyball in required physical education classes at Ragsdale High School in Jamestown, North Carolina prior to the Fall of 1975.
2. The subjects were assumed to be beginners and/or intermediates in volleyball skill level.
3. Dimensions for the constructed test were determined empirically.
4. Subjective judges' ratings were used to evaluate the subjects' ability to use the forearm pass in a game situation.

SUMMARY

Since the invention of volleyball in 1895, the game has rapidly grown in popularity. What started as an indoor recreational game for middle aged men has developed into an internationally competitive sport. When volleyball was introduced into the levels of Olympic competition, a new aspect of this sport was revealed.

The offensive and defensive strategy exhibited by the Japanese teams in 1964 gave birth to the sport that is now called "power volleyball." The bump-set-spike sequence had replaced simple "volleying" and ball placement and powerful hitting became strategic objectives for the game.

High schools and colleges are teaching the fundamentals of the game and are competing in the sport of volleyball. In teaching and evaluating motor performance, a good skill test is a vital tool. Skill tests have been widely used to evaluate the performance of several volleyball skills, but only a few have been developed to measure the ability to perform the forearm pass. It is the purpose of this investigation to develop a valid and reliable test to measure this skill at the high school level where players are assumed to be beginners and/or intermediates in volleyball playing ability. The test was developed to encompass the variables of: ball control, ball reception, height, distance and accuracy into a single evaluation. This test was designed to measure only the pass and not overall playing ability.

CHAPTER II

REVIEW OF LITERATURE

The review of related literature will encompass two areas of concentration. The initial phase deals with the development of the use of the forearm pass in the sport of volleyball, focusing primarily on the reasons why this type of pass was introduced into the game. The second phase will explore previous research in the area of testing the skill identified as the forearm pass or bump pass. Throughout the review of literature the terms forearm pass and bump pass will be used interchangeably and will identify a single skill.

DEVELOPMENT OF FOREARM PASS

The importance of the use of the bump pass was changed drastically with the successful performance of this skill by the Japanese players in the 1964 Olympics held in Tokyo. (57:25) Prior to this time the skill known as the bump pass was used only as a "last chance" shot. According to Shondell and McManama, "the forearm pass is now rated by many as the most important fundamental in volleyball." (51:37)

What at one time was referred to as an emergency shot has progressed into a highly developed skill. (49:35) The bump pass evolved from a skill previously called the chest pass. "The

history of the bump pass in the United States goes back to at least 1946. Not until the 1964 Olympics did it really begin to replace the chest pass." (57:25)

Because of rule changes and more highly developed fundamentals as those witnessed in the 1964 games, the bump pass has become an integral part of the sport known today as power volleyball. "Rule changes brought about the need for a hit that is clean and clear, not allowing the ball to come to rest on the hands even momentarily." (7:6) Ball reception and defensive maneuvers emphasize the importance of the forearm pass.

> The receiving player in volleyball must play the ball cleanly without letting the ball visibly come to rest or without making double contact with the ball. In recent years nearly all participants in the game of power volleyball have resorted to an underhand 'bump pass' . . . . (26:3)

In a brief statement concerning the history of volleyball, Carol Mushier wrote, "Volleyball in the 1964 Olympics in Japan instigated the movement of 'mass' volleyball to 'power' volleyball and the development of new skills." (16:168)

The development of the forearm pass can be marked in the history of the game at two distinct points. In the late forties it was seen as a desperation play or a last chance shot. (51:37) In the 1964 Olympics the skill became a vital part of the strategy of the sport and gave way to the game of power volleyball. (16:168)

SKILL TESTS FOR FOREARM PASS

The use of a wall to hit the ball against is not new nor is it unique to the game of volleyball. Other sports such as

tennis and basketball have utilized a wall and/or a target on a wall to evaluate isolated skills and playing ability. The use of a wall to practice against, in lieu of a partner, has been an accepted method for skill development and for skill drills in volleyball and in other sports.

Many authorities have suggested utilization of a wall in performing skill drills for the bump pass. (9, 10, 16, 24, 43, 54, 55) Some of the drills involve lines or targets while others suggest that just hitting the ball against the wall is valuable in learning the bump pass. Only six known investigators have developed a skill test for the forearm pass (19, 24, 26, 38, 53, 60) and of these, three are performed against a wall. (19, 26, 53)

Before describing the volleyball skill tests for the bump pass, the investigator wishes to state that the wall tests described in the text of this study were adapted from wall tests designed for the set-up pass or overhead pass and no statistical information pertinent to the bump pass was given. No statements or figures of validity or reliability were available in the investigated literature concerning the forearm pass when tested on the wall.

Sandefur (19:70) modified the Brady Wall Volley Test and incorporated the use of the forearm pass instead of the overhead volley for which the test was designed. A five foot square was inscribed on the wall above a line eight feet from the floor. There was no restraining line on the floor used in this test. Using the bump pass, subjects volleyed the ball into the wall target for one minute. Only one trial was given. Score indicated the

number of times the ball hit in the wall target. One point was given for each time the ball hit in the target. Only the bump pass could be used. A score of 45 or over was considered excellent, 38-44, good; 29-37, fair; 20-28, need more work; and under 20, get help--using improper technique. This test was primarily concerned with the variables of: ball control, as illustrated by the use of repeated volleys, and height and accuracy, as indicated by the use of a target and a specified height factor; the line eight feet from the floor.

Singer (53:185-194), in his article "Sequential Skill Learning and Retention Effects in Volleyball," described a wall volley test designed for the set-up and modified this test for the "dig," which by description of the technique was the forearm pass. The test incorporated the designs of several other wall volley tests designed for the set-up or overhead pass. (31, 33, 44, 48) A restraining line six feet from the wall was marked on the floor. A line on the wall was marked ten feet up from the floor. There was no target area involved in this test. Subjects were required to hit the ball from behind the restraining line on the floor to the area on the wall above the ten foot line. Only the bump pass was to be used. One trial of sixty seconds was given. The score indicated the number of times the ball was hit in the designated area. No indications of scoring breakdown were given in this article as the major concern of Singer's study was not the development of a skill test. Singer wanted to find out if the sequence in which one learned four volleyball skills had any effect upon

how well these skills were retained. The four skills tested were: the spike, the serve, the set-up and the dig or bump pass. The same test was used for the set-up and the dig pass.

The primary concern of this test was height of the pass as indicated by the line drawn on the wall ten feet in height and distance as illustrated by the use of the restraining line marked on the floor six feet from the wall. Ball control was also a variable in this test as indicated by the use of repeated volleys. Accuracy was not a factor in Singer's study.

Slaymaker and Brown (26:99) developed a wall test for the bump pass. This test had a restraining line of six feet from the wall marked on the floor. No line or target area was drawn on the wall. One trial of thirty seconds was allowed. The score indicated the number of times the ball hit against the wall. One point was allotted for each contact with the wall. The subjects were to use only the bump pass and were instructed to stand behind the six feet restraining line. Scoring figures for men were 0-21, poor; 22-31, average; 32-39, good; and 40 or better, considered excellent. For women, scores were 0-17, poor; 18-27, average; 28-34, good; and 35 or better, excellent. No information concerning how reliable or valid this test was was given.

In the Slaymaker and Brown test, a restraining line was used which indicates that distance was an important factor. Repeated volleys were used as ball control was a variable. Since there was no line or target on the wall, height and accuracy were not studied in this investigation.

Each of three previously described wall volley tests were modified from wall set up tests and specific data were not given as to the validity or reliability of these bump-to-the-wall tests. Since reliability and validity figures are specific to the skill being measured, figures found in the set-up tests are not applicable to the tests when the bump pass is used.

The investigator was interested in finding a previously validated test to use as a criterion test for this study, but none was available. None of the three previously described tests contained all of the variables the writer wished to investigate. The purpose of this study was to develop a skill test for the bump pass that had as its variables: ball control, as measured by using repeated volleys; ball reception, height, distance and accuracy. None of the above tests had all of these factors involved.

Three other known tests have been developed for the forearm pass. None of these three use the wall for rebounding purposes. Helmen (38:47-53) developed a volleyball skill test battery for college women. Included were tests for the bump, set and spike. The bump test was a self-volley type evaluation using two non-consecutive thirty second trials. The testing area was a fifteen foot square marked on the floor adjacent to the wall. A line indicating a height of twelve feet was marked on the wall. The subjects were instructed to bump the ball to themselves for a period of thirty seconds while staying in the prescribed fifteen foot square. They were to hit the ball at least twelve feet into the air. This could be measured by the twelve foot line on the

wall. If a subject lost control of the ball, she recovered her own ball and a new count started from zero. If the ball touched the wall, was below the twelve foot line or the subject moved out of the fifteen foot square on the floor, the volley was not counted but scoring continued. Only those balls that were hit from within the square and traveled the required twelve feet in height were counted. Only the bump was to be used. A panel of judges rated the subjects as they played in a game situation. Test validity was established by correlating the judges' rating with the test scores. A figure of .50 was found when using the total of both trials in the correlation and a figure of .43 when the best trial was computed against the judges' ratings. The test re-test method was used to obtain the reliability figures of .76 for the total of both trials and .71 for the best trial.

The primary purpose of Helmen's bump-to-self test was to measure the factors of height, as indicated by the requirement to hit the ball at least twelve feet high, and ball control, as it was an important part of the test to keep the ball going. Distance and accuracy were not variables in this skill test for the fore-arm pass.

Shay (24:22-23) devised a skill test for the bump pass that included hitting the ball over the net into strategic areas of the opposite court. A rope was strung between two volleyball standards at a height of eight feet from the floor. Target areas in the right and left hand corners nearest the net were marked on the opposing court. The test subject was positioned in the

center back position on the court and was required to pass the ball over the rope into the target areas on the opposing court. Only the bump pass was to be used. Twenty single hit trials were given. The score was derived by counting the number of balls that passed over the rope and landed in the target area or on the target lines. Only those balls that were correctly hit, went over the eight foot rope and landed in the appropriate places were counted.

The purpose of this test was to measure height, as exhibited by the use of the eight foot rope, distance, because the subject was to stand at the center back position of her own court and accuracy, as it was required of the subject to hit the balls into designated targets. Ball reception or controlling an oncoming ball was not a factor in this test. No information dealing with validity or reliability figures was available for this skill test.

Bosen (60), calling the skill being measured the "bounce pass," was mainly concerned with the height and distance one could hit the ball when receiving the serve. A mechanical server gave impetus to the ball. The objective of the test was to hit the ball at least ten feet high and twenty feet in distance. Ten trials were given on three consecutive days. Only those balls that met the height and distance requirements were counted. A reliability figure of .55 was established by using Analysis of Variance between the three trials. Content validity was claimed on the basis of performance on the test.

The skill test devised by Bosen was primarily concerned with height and distance by requiring that the ball be hit at least ten feet high and twenty feet in distance. Ball reception was a factor in this test. Accuracy or ball placement was not a factor.

SUMMARY

Several good skill tests have been developed to measure the ability to perform the forearm pass. The investigator found three wall volley type tests that were designed for the set-up, but used the bump pass instead of the overhead pass. Three other tests were found that were designed for the forearm pass that required the ball to be hit a specific height and distance. Although all of these tests are valuable tools of measurement, the investigator found that no one single test contained all the variables involved in the performance of the forearm pass. The writer was interested in finding a test to measure the ability of high school girls to perform the bump pass. The writer was also interested in the variables of ball control (repeated volleys), ball reception, height, distance and accuracy of the pass. The tests found in the investigation of previous volleyball skill testing were good, but the writer found no single test which satisfactorily incorporated all the variables necessary to evaluate the ability of high school girls to perform the bump pass.

CHAPTER III

PROCEDURE

It was the purpose of this study to construct a reliable and valid skill test for the forearm pass in volleyball. After a careful investigation of the literature dealing with the bump pass and testing the ability to perform the bump pass, the writer felt that there was a need for further research in this area of volleyball. There has been a great deal of emphasis put on this skill and very little specific research done on this type of pass, especially in test construction.

TESTING PROCEDURES

The procedure followed for this study is described in nine major areas: (1) assumptions for test formulation; (2) the description of the test; (3) the selection of a rating scale; (4) the selection of the subjects; (5) the selection of the judges; (6) training of the judges; (7) the administration of the test; (8) judges rating of the subjects; and (9) the tabulation and the treatment of the data.

Assumptions for Test Formulation

As part of the procedure for this study, the investigator wishes to state several assumptions upon which this test was based. The specified dimensions of the floor and wall space were based

upon the premise that most ball receptions below chest level are handled behind the ten foot line on the volleyball court. The ball has to receive sufficient impetus to reach or clear the net. This test will have a ten foot restraining line. The ball should, as learning progresses, come to the middle of the net so that it can be handled by the player designated as the setter. A player must be able to receive the ball from one angle and pass to another. A player must be able to position her body in relation to the ball. This test will involve repeated volleys to measure ball control. Accuracy is involved when the player attempts to receive the ball in the back court and bump it in such a fashion that it goes towards the center of the net with sufficient height to be played efficiently or to clear the net. This test will have a target area marked on the wall at a height of ten feet from the floor. It is the opinion of the writer that these dimensions and requirements are empirically valid.

Description of Test

The test was designed to be a wall volley type test. The testing station was an unobstructed wall space at least fifteen feet high and ten feet wide. A restraining line was marked on the floor ten feet from and parallel to the wall. A line ten feet from the floor was marked horizontally on the wall. A target was drawn on the wall at the ten foot line. Lines of five feet in length extended above and perpendicular to the ten foot horizontal wall line formed the target. The target area was

composed of circumscribed rectangles of five by ten feet, five by eight feet, and five by six feet with point values for the rectangles of one, two, and three respectively. A diagram of the target is found in Figure 1. A complete diagram of the testing station is included in Appendix A.

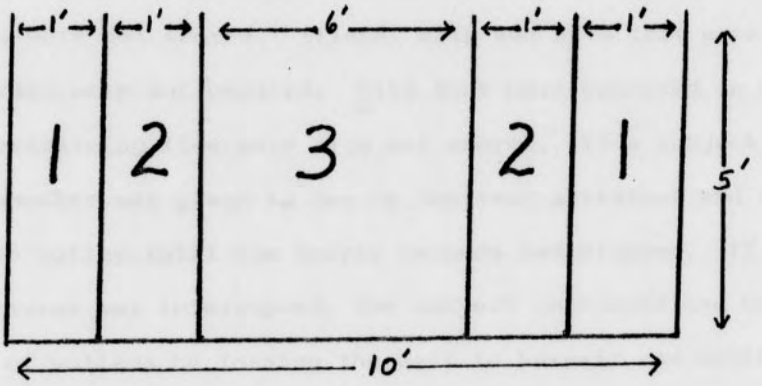


Figure 1

Diagram of Wall Test Target

The equipment necessary for the test was: (1) properly inflated rubber volleyballs; (2) a stop watch; (3) score cards, and (4) a marked testing station. A diagram of the score card used in this test is included in Appendix B.

The requirements for the test were as follows: The subject was to toss the ball to herself to initiate the wall volley. She was to volley the ball against the wall from behind the ten foot restraining line. Only the forearm pass was to be used. The subject was to continue to volley the ball against the wall for a period of thirty seconds. Only balls hitting in the target area were counted. Balls that touched the wall outside of the target area were not scored. Illegal hits and hits that were not forearm passes were not counted. Hits that were executed on or over the restraining line were also not scored. If a subject lost the ball, another was given to her by the test assistant and she continued to volley until the thirty seconds had elapsed. If the series of passes was interrupted, the subject continued and began her series of volleys by tossing the ball to herself and hitting the ball to the wall. A sequence of toss-bump toss-bump was not allowed. The ball had to be clearly and consecutively bumped to the target area. The ball was to be received and passed from behind the ten foot restraining line. The objective of the test was to keep the ball going against the wall for a period of thirty seconds using only the forearm pass. Four trials were given with one minute rest in between trials.

Selection of a Rating Scale

The investigator did not find a rating scale that could be used to evaluate the forearm pass when it was performed in a game situation. The most feasible rating scale that could be found was Joan Suttinger's Index of Volleyball Ability for College Women. (72) A copy of Suttinger's Index is included in Appendix C. Although it was devised for the set-up and used to evaluate the overall playing ability of college women, it serves as a guide in the development of the rating scale used in this study. It was the belief of the investigator that the rating scale, when used by qualified judges, would give an accurate measure of the subjects' ability to use the forearm pass in a game situation. The judges would be able to subjectively rate the players on their ability to receive serves, pass with sufficient height and distance, control hits and place the ball in an area conducive to efficient play. The criteria for the subjective ratings were as follows:

Rating Scale

3 (Good)

Player handles the ball with ease, using clasped hands and forearms, and displays control over hits. Passes are high and accurate. Placement is evident. Player rarely has trouble receiving serves and rarely misplays the ball.

2 (Fair)

Player has control over the ball but lacks the quality of ease. Passes and hits are usually high and accurate and some evidence of placement is seen. Player usually handles the serve without much trouble.

1 (Poor)

> Player is often unable to control or handle the ball, and uses palms or fists at times. Forearm passes and hits are rarely attempted and/or are unsuccessful. Serve receptions and returns are usually unsuccessful or inconsistent.

This scale was used by the judges to rate each player ten times in the course of a volleyball match. A copy of the rating sheet is included in Appendix D.

Selection of Subjects

One hundred high school girls from Ragsdale High School in Jamestown, North Carolina were selected to participate in this study. All had some experience in volleyball. Information and questionnaires were distributed to approximately two hundred female students who were known to have completed at least one unit of volleyball in general physical education classes prior to the Fall of 1975. The subjects used in this study were the ones that responded favorably to the design of the study.

The only requirements to be met were: (1) the completion of one unit in volleyball and (2) the time necessary to participate in the study. Those that had the background and were willing to take part in the study were accepted as subjects. As the study progressed, several subjects dropped out after the initial testing phase. Other subjects were found from elective physical education classes so that the number of subjects would reach the desired total of one hundred.

The subjects were informed that the study would take two separate days. The study would involve two phases. The initial

phase was the administration of the investigator's constructed wall test for the forearm pass. This test would be given on two consecutive Saturdays and after school for one week. The subjects chose the time slot most convenient for them. The second phase of the study would have the subjects participating in a volleyball match while being rated by a panel of judges. The judges would be evaluating the players' ability to perform the forearm pass in a game situation. The rating sessions were to be held on two consecutive Saturdays and the subjects chose the day and the time slot best suited for them. Several subjects stated that it would not be possible for them to be present at either of the rating sessions. A rating session was set up on a week day after school to accommodate these subjects.

At the conclusion of the testing program, one hundred subjects had taken the wall volley test for the forearm pass. These same girls were rated by a panel of five judges as they played in a match. The testing and rating sessions lasted approximately five weeks until the desired number of one hundred subjects had been obtained.

Selection of Judges

The investigator desired a panel of five judges for the rating sessions. While looking for qualified persons, it was discovered that the same five judges could not be present at all of the rating sessions that had been previously planned. The investigator felt that five rating scores would be more valid

than three, so seven judges were selected to insure that five would be present at each rating session. Two combinations of the seven selected judges were found to be satisfactory. Judges one, two, three, four, and five participated in three rating sessions, evaluating a total of fifty-four subjects. Judges one, two, three, six, and seven participated in two rating sessions, evaluating a total of fifty-six subjects.

The criteria used for selecting the judges were: (1) a physical education major; (2) experience in teaching high school girls' volleyball; (3) a good understanding of the latest rules concerning the underhand hit. The judges were found from within and around the Jamestown area. All judges met the criteria and were qualified to participate in the rating sessions. All persons selected to be judges had either coached, officiated or played under the rules governing power volleyball. The technique of the forearm pass was familiar to everyone.

Training of the Judges

Two training sessions were held by the investigator to thoroughly explain the role of the judges and their duties. The initial meeting was held to explain the rating scale, the scoring system and the technique of the forearm pass. All seven judges were present at the explanatory meeting. The second session was a practical session. A brief playing period was held to allow the judges to practice observing and scoring players during a game situation. Persons playing for this practice session did not

participate in the study. After the mock rating session, the judges and the investigator met to discuss any problems and make suggestions. All seven judges were present at the practice rating session. All judges felt confident that they could perform their tasks and stated that they understood the rating scale, the scoring system, and the skill that they had been asked to evaluate.

Administration of Test

On the initial testing day thirty-five subjects gathered in the gymnasium of Ragsdale High School to hear explanations of the wall test. The procedure was explained by the investigator and any questions were answered. The subjects were assigned a number and arbitrarily divided into two groups. Since there were two testing stations set up, each group went to a different station. The tests were given by previously trained test administrators assisting the investigator. Subjects who were not momentarily involved in the testing assisted the administrators by retrieving the balls and filling out score cards.

The test administrator at each station was assisted by a timer, a scorer and several ball retrievers. The timer gave the signal, "ready go," and started the stop watch. The test administrator watched the subject for correct hits and called out loud to the scorer the point value of balls that hit within the target area. Balls that hit on a target line were given the higher point value. The scorer was seated at the restraining line

with the subject's numbered score card. The scorer watched for foot faults and did not count those balls hit when the subject's foot was either on or over the restraining line. At the end of the thirty second time limit, the timer called out, "stop." While the subject took a one minute rest, the scorer tallied the points and recorded them in the proper place on the score card. After the rest period, the subject took the second trial. This procedure continued until the subject had completed all four of the required test trials. On subsequent testing days, the same procedure was followed until the one hundred subjects had taken the wall test for the forearm pass.

Judges' Rating of Subjects

On the initial rating session day, thirty subjects were present. The investigator had previously prepared numbered pinnies for the subjects to wear. The pinnie number corresponded with the number on the subject's score card. The pinnies were dark blue with white numbers so that the judges would have no difficulty identifying the subjects. The subjects put on the pinnies with their respective numbers and at random, twelve were selected to play the first match. The judges rated only six players at one time.

Five judges' scoring tables were placed six feet from the sidelines of the rating court; two on one sideline and three on the other. The judges did not communicate, nor did they share a common table. The judges were equipped with pencils and scoring sheets.

The rating court was set up so that judges viewed players on one side of the net. During play, each judge rated each of the six players on ten executions of the forearm pass in accordance with the set rating scale. As soon as a subject had been given ten ratings by all the judges, another subject took her place on the court. This procedure continued until all of the subjects present had been rated. At the end of each match, the investigator collected the rating sheets and totaled the figures. The investigator assisted the judges in any way possible, but did not participate in the session as a judge. At subsequent rating sessions, the same procedures were followed until all of the subjects tested had also been rated by a panel of five judges.

TABULATION AND TREATMENT OF DATA

Upon completion of the wall testing, test trials were tabulated independently. The results of test trials I and III were then totaled for each subject, as were those for trials II and IV. The odd - even method of calculating reliability was used. The totals of test trials I and III were correlated with the totals of trials II and IV using the Pearson Product Moment method of correlation. This correlation was used to establish test reliability. Calculations were first done by hand using a scattergram, then by computer as a check. Both figures were the same.

After all the test subjects had been rated and judges' scores tallied, this information was transferred to the subject's

score card. The objectivity of the separate judges' ratings were tested by computer using the Pearson Product Moment method of correlation. The ratings given by each judge were statistically compared to those of every other judge. Since there were seven judges in all involved in the rating sessions, a total of seventeen correlations were seen.

To establish test validity, the judges' ratings were statistically compared to the wall test scores. This comparison was done four different ways: (1) the total of all four test trial scores with the total of all five judges' ratings; (2) the single best trial score with the total of the five judges' ratings; (3) the total of the three best trials with the total of the five judges' rating; and (4) the average of the four test trials with the total of the five judges' rating. The Pearson Product Moment method of correlation was used to compare these figures. The calculations were first done by hand with the scattergram, then by computer as a check.

SUMMARY

One hundred subjects were used for this study. The subjects were female students at Ragsdale High School in Jamestown, North Carolina. All subjects had completed at least one unit of volleyball in general physical education classes prior to the Fall of 1975. The girls were between the ages of fifteen and eighteen and were considered to be of beginner and/or intermediate skill level in volleyball.

Five judges were to be used as a rating panel in this investigation. It was found that the same five judges could not participate in all of the rating sessions. Seven judges were selected to insure that a total of five could be present at each session. All judges met the criteria for qualification and participated in training sessions prior to rating the test subjects in a playing situation. Each judge rated each player a total of ten times during the course of a volleyball match.

Subjects were first given the wall volley skill test and then were rated by the panel of judges on their ability to use the bump pass in a game situation. The wall testing and the rating sessions were not given on the same day.

The collected data from the four test trials were assembled and treated with the Pearson Product Moment method of correlation to determine test reliability. Each judges' score sheet was tallied and the judges' ratings were compared to one another to determine the objectivity of those ratings. Test validity was established by comparing the total of the judges' ratings with the test scores. The Pearson Product Moment method of correlation was used in all cases when data were compared. All calculations were either done by computer or checked by computer.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

The purpose of this investigation was to construct a valid and reliable volleyball skill test for the forearm pass. The test was designed to be used by players of beginning and/or intermediate skill level. The test was administered to one hundred high school girls from Ragsdale High School in Jamestown, North Carolina. The subjects all had completed at least one unit of volleyball in general physical education classes.

The investigation was divided into two phases. The initial phase consisted of constructing and administering a volleyball skill test for the forearm pass. The second phase involved a panel of five judges who rated the subjects as they played in a volleyball match. The judges were only interested in the execution of the forearm pass in a game situation, not in overall volleyball skill or ability.

After all the data had been collected and tabulated, the figures were analyzed by means of correlation calculations. The Pearson Product Moment method of correlation was used in comparing all data. The data were analyzed and interpreted to obtain information about three aspects of the investigation: (1) the objectivity of the judges' rating; (2) the reliability of the constructed test; and (3) the validity of the constructed test.

Objectivity of Judges

A total of seven judges were involved in the study, though only five were used in any one rating session. The purpose of the judges was to rate the test subjects, as they played in a game situation, on their ability to perform the bump pass. The data from the judges' rating sessions were to be compared to the subjects' skill test scores to establish the validity of the constructed test.

Before the ratings could be compared to any test scores, it was necessary to ascertain just how objective the judges were. According to Barrow and McGee (2:38), objectivity is the "degree of uniformity with which various people score the same test." In this case the investigator was interested in finding the "degree of uniformity" (2:38) with which the seven judges rated the test subjects on their ability to execute the forearm pass during a game. All seven judges' total rating scores were intercorrelated to obtain a measure of objectivity. Judges one, two, three, four, and five rated a total of fifty-four subjects. Judges one, two, three, five, and six rated a total of forty-six subjects. The Pearson Product Moment method of correlation was used to compare the data and all computations were done by computer.

Once a correlation figure is obtained, means for interpretation are needed. The writer chose to use a scale suggested by Barrow and McGee (2:38) to interpret the objectivity figures obtained in the correlation of the judges' rating. The scale is as follows:

.95 - .99	excellent
.90 - .94	very good
.85 - .89	acceptable
.80 - .84	acceptable
.75 - .79	poor
.70 - .74	poor
.65 - .69	questionable
.60 - .64	questionable

The seven judges participating in this investigation produced objectivity coefficients ranging from .971 to .885. According to the scale used for interpreting the figures, the objectivity of the judges ranged from "excellent" to "acceptable." Of the seventeen correlations computed for the purpose of obtaining the objectivity figures, two were interpreted as "excellent." Fourteen as "very good" and only one as "acceptable." According to Barrow and McGee (2:38), "the degree of uniformity" between the judges involved in this study was very high (Table I, page 33).

The investigator felt that any combination of the seven judges could have been used to evaluate the subjects and still there would have been a high degree of consistency between the ratings. Since all of the judges seemed to be in agreement, the writer felt that the fact that the same judges were not present at every rating session did not adversely affect the validity of test. Objectivity is a measure of "uniformity" (2:38) between test scorers. The scorers in this case were the judges and they seemed to be uniform and consistent in their rating.

TABLE I

Objectivity Coefficients Obtained from the Seven Judges

Judges Numbers	Number of Subjects Rated	r
1 vs 2	100	.92
1 vs 3	100	.903
1 vs 4	54	.925
1 vs 5	54	.937
1 vs 6	46	.967
1 vs 7	46	.922
2 vs 3	100	.926
2 vs 4	54	.902
2 vs 5	54	.915
2 vs 6	46	.93
2 vs 7	46	.971
3 vs 4	54	.885
3 vs 5	54	.926
3 vs 6	46	.917
3 vs 7	46	.949
4 vs 5	54	.917
6 vs 7	46	.93

Reliability of Constructed Test

Reliability is the degree of consistency with which a test can be administered. A reliable test is one that can be given many times and reveal very similar results. Reliability in this study was measured by the odd - even method. Four test trials were given and the total score for trials I and III were statistically compared to the total for trials II and IV. In interpreting the obtained reliability coefficients, the writer again chose to use a scale suggested by Barrow and McGee. (2:38) The scale is as follows:

.95 - .99	excellent
.90 - .94	very good
.85 - .89	acceptable
.80 - .84	acceptable
.75 - .79	poor
.70 - .74	poor
.65 - .69	questionable
.60 - .64	questionable

The data from the one hundred subjects participating in this study produced a reliability coefficient of .82 for the constructed test. Interpreting this figure by using Barrow and McGee's scale, the reliability of the test was considered "acceptable." When the reliability coefficient was treated with the Spearman-Brown Prophecy formula for double the number of trials, the coefficient was stepped up to .90 which was considered to be "very good." The following table shows the reliability figures for the constructed test (Table II, page 35).

Table II

Reliability Coefficients for
Wall Volley Bump Pass Test
N-100

Trials	Mean	SD	r
I and III	28.65	12.25	
vs			.82
II and IV	31.35	13.85	
Estimated for 4 trials*			.90

*Using Spearman-Brown Prophecy Formula

Validity of Constructed Test

When one is testing for validity, one is looking to see if the test does in fact measure what it was designed to do. Validity can be measured by comparing scores on a new test to scores on a previously validated test that was designed to measure the same entity. A test can also be measured for validity by comparing subjective judges' ratings to test scores. The investigator chose the latter method for determining the validity of the constructed wall volley test for the forearm pass. The one hundred subjects participating in this study first took a skill test designed to measure their ability to perform the forearm pass. The skill test involved four trials. Secondly, the subjects played a volleyball match while being rated by a panel of five judges.

Validity for this test was determined by comparing the judges' rating to the subjects' test scores. Validity was tested for in four different ways: (1) the total of five judges' ratings with the total of the four test trials; (2) the total of five judges' rating with the single best test trial score; (3) the total of five judges' rating with the total of the three best trial scores and (4) the total of five judges' ratings with the average of the four test trial scores. The data were treated these four ways to determine the best way to score the test.

The writer again chose a scale suggested by Barrow and McGee to derive meaning from the validity coefficient. The scale is as follows:

.95 - .99	excellent
.90 - .94	excellent
.85 - .89	excellent
.80 - .84	very good
.75 - .79	acceptable
.70 - .74	acceptable
.65 - .69	questionable
.60 - .64	questionable

All of the correlations calculated used the Pearson Product Moment method and were done first on scattergrams then checked by computer. When the total of all four test trials was correlated with the total of the five judges' ratings, the validity coefficient was .79, which can be interpreted as "acceptable." The correlation of the single best test score with the total of the

five judges' ratings yielded a validity coefficient of .76, which is also considered as "acceptable." The total of the three best test trial scores correlated with the total of the five judges' ratings yielded a validity figure of .79, which can be interpreted as "acceptable." The highest validity coefficient was obtained when the average of the four test trials was compared to the total of the five judges' ratings. The validity figure was .82, which is interpreted as "very good" (Table III).

Table III

Validity Coefficients for Wall Volley Bump Pass Test N-100

Score	r
Best single trials	.76
Best three of four trials	.79
Total of four trials	.79
Average of four trials	.82

SUMMARY

The purpose of this investigation was to construct a valid and reliable test to measure the forearm pass skill of high school girls. The subjects were one hundred high school girls to

whom the test was administered in the Fall of 1975. After the skill test scores had been obtained, test trials I and III were totaled and trials II and IV were totaled. From these two figures test reliability was measured. The reliability of the test was determined by the odd - even method. The Pearson Product Moment method of correlation was employed to yield the reliability coefficients. The coefficient of reliability for the constructed test was .82, which was interpreted by Barrow and McGee's scale (2:38) to be "acceptable." When the coefficient was stepped up by the Spearman-Brown Prophecy Formula for double the number of trials, the coefficient of reliability was .90, which according to Barrow and McGee was "very good."

Five judges rated the subjects ten times each during a game situation. Intercorrelations between the judges were calculated for the purpose of determining the objectivity of the separate ratings. Comparing the results of each judge with the others indicated the "degree of uniformity" (2:38) or consistency with which each judge evaluated the skill performed. The coefficients of objectivity ranged from .971 to .885, which according to Barrow and McGee (2:38) ranged from "excellent" to "acceptable." Of the seventeen correlations computed for the purpose of obtaining the objectivity figures, two were interpreted as "excellent," fourteen as "very good" and one as "acceptable."

The coefficients of validity were determined by correlating the results of the skill test scores with the total of the five judges' subjective ratings. Validity was determined four

different ways. The total of the five judges' ratings were statistically compared to: (1) the total of the four test trial scores; (2) the singles best test trial score; (3) the total of the three best test trials scores, and (4) the average of the four test trials scores. The validity coefficient for the total of the four best trial scores was .79, which according to the scale of Barrow and McGee was considered "acceptable." For the single best score, the validity figure was .76, which when interpreted by the Barrow and McGee scale was considered "acceptable." The total of the three best trial scores yielded a validity coefficient of .79, which was considered to be "acceptable." The best validity figure was found when the average of the four test trial scores was computed. The coefficient for the average score was .82, which was interpreted to be "very good."

CHAPTER V

SUMMARY AND CONCLUSIONS

Since the origin of volleyball in 1895, the game has grown to become one of America's most popular sports. Educational institutions at all levels offer opportunities for learning and competing in volleyball. Evaluation is a necessary part of the instructional program in physical education. The administration of skill tests has become an accepted practice in the evaluation of playing performance. In volleyball, one of the most prevalent methods of testing skills is the wall volley, which measures the ability of a student to exhibit ball control and hitting skill in the form of repeated volleys against a wall. Many of the previous evaluations were designed to measure the skill in volleyball known as the set-up or the overhead pass. A more recently introduced skill, the forearm or bump pass, has not had the full impetus of evaluation.

It was the purpose of this investigation to construct a valid and reliable instrument to measure the ability of high school girls to perform the forearm pass. To date six tests have been developed to measure this skill; three were wall volley tests that were adapted from set-up tests and three were designed with the primary interest of height and/or distance of the pass. The tests are acceptable tools of measurement, but the investigator

found that these instruments did not contain all of the variables, in one test, that was important for the complete evaluation of the forearm pass.

The test constructed for this investigation was a wall volley test for the forearm pass to be used with players of beginner and/or intermediate skill levels. The test consisted of hitting the ball into a target on the wall for a period of thirty seconds. A restraining line was drawn on the floor ten feet from and parallel to the wall. The subjects were to make contact with the ball from behind the line. Only the bump pass was to be used. The wall target consisted of a rectangle drawn on the wall ten feet up from the floor. Perpendicular vertical lines extending from the ten foot horizontal line divided the target into five scoring areas. The center rectangle of the wall target was six feet long and five feet high. This represented the highest scoring area and was worth three points. To the immediate right and left of center, the scoring area was worth two points. The outer areas of the target were worth one point. The target was representative of the middle third of a volleyball net. The purpose of the target on the wall was to require accuracy of the pass. The purpose of the restraining line and the height of the target was to require that the ball be hit a specified height and distance. The inclusion of repeated volleys was to require ball control and ball reception. The subjects were required to take a total of four test trials. The one hundred subjects involved in the test were high school girls whose ability

ranged from the beginner to the intermediate levels of volleyball skill. The test was administered in the Fall of 1975.

The reliability for the constructed test was measured by the odd - even method. Test trials I and III were totaled and statistically compared to test trials II and IV. The Pearson Product Moment method of correlation was used to determine the reliability coefficients. The one hundred subjects who were involved in the wall test yielded a reliability figure of .82, which when interpreted from the scale suggested by Barrow and McGee (2:38) was considered to be "acceptable." When the coefficient was treated with the Spearman-Brown Prophecy Formula for double the number of trials, the coefficient of reliability was .90, which according to Barrow and McGee was "very good." The constructed test was considered to be an acceptable measure of the forearm passing ability of the subjects to whom the test was administered.

A panel of five judges observed and rated the subjects during a game situation. The judges were only interested in the ability of the subjects to perform the forearm pass. Seven judges were used in all, with teams of five participating in each rating session. The judges' scores were tested for objectivity by comparing each judge with every other judges' rating. The Pearson Product Moment method of correlation was used and the data were processed by computer. The objectivity figures ranged from .885 to .971, which according to Barrow and McGee, ran from "acceptable" to "excellent." Of the seventeen correlations

computed for the purpose of obtaining the objectivity figures, two were considered "excellent," fourteen as "very good" and one was interpreted as "acceptable." Comparing the results of each judge with the others indicated the "degree of uniformity" (2:38) with which each judge evaluated the skill performed.

The coefficients of validity were computed by statistically comparing the judges' ratings to the skill test scores. Validity was determined four different ways. The total of the five judges' ratings were correlated to: (1) the total of the four test trial scores; (2) the single best trial score; (3) the total of the three best test trial scores, and (4) the average of the four test trial scores. The validity coefficient for the total of the four trials was .79, which was considered "acceptable" according to Barrow and McGee. (2:38) When the single best score was used, the validity coefficient was .76, which was "acceptable." A figure of .79 was found when the total of the three best trial scores were computed. This coefficient was interpreted as "acceptable" according to Barrow and McGee. (2:38) The highest coefficient of validity was found when the average of the four test trials was computed against the total of the five judges' ratings. The validity coefficient was .82, which was considered to be "very good" according to Barrow and McGee. (2:38) The data were treated these four ways to help determine the best way to score the test.

CONCLUSION

The purpose of this investigation was to construct a reliable and valid skill test for the forearm pass. According to the interpretation of the statistics, the test yielded a reliability coefficient of .82 for two trials and .90 estimated for four trials. The validity coefficient was .82. The test is considered to be both reliable and valid for the purpose for which it was designed. Because the average of the four test scores compared to the total of the judges' ratings resulted in the highest validity figure and the reliability figure of .90 was estimated for four trials, the most valid and reliable way to administer the test would be to give four trials and take the average score for an evaluation of the skill.

RECOMMENDATIONS

The following are recommendations for further study:

1. A study that would be a repetition of this investigation and would determine the effectiveness of the test in measuring the forearm passing ability of more advanced players.
2. An investigation that would modify the dimensions of the constructed test.
3. The expansion of the three point rating scale into one that has five or six categories for greater discrimination in evaluating the forearm pass.

BIBLIOGRAPHY

BIBLIOGRAPHY

A. BOOKS

1. Anthony, D., and J. Murray. Volleyball--Do It This Way. London: South Alberands Street, 1967.

2. Barrow, Harold M., and Rosemary McGee. A Practical Approach to Measurement in Physical Education. 2nd ed. Philadelphia: Lea and Fibiger, 1971.

3. Boyden, Douglas, Roger Burton, and William Odeneal. Volleyball. Washington, D. C.: United States Volleyball Association, 1965.

4. Cherebetiu, Gabriel. Volleyball Techniques. Hollywood, Calif.: Creative Sports Books, 1969.

5. Clarke, H. Harrison. Application of Measurement to Health and Physical Education. 3rd ed. Englewood Cliffs, N. J.: Prentice Hall, Inc., 1959.

6. Cohen, Harland. Power Volleyball Drills. Hollywood, Calif.: Creative Sports Books, 1966.

7. Egstrom, Glen and Frances Schaafsma. Volleyball. 2nd ed. Dubuque, Iowa: Wm. C. Brown Co., Publishers, 1972.

8. Emery, Curtis Ray. Modern Volleyball. New York: MacMillian Co., 1961.

9. Keller, Val. Point, Game and Match. Hollywood, Calif.: Creative Sports Books, 1968.

10. Keller, Val. Point, Game and Match--Coaching Supplement. Hollywood, Calif.: Creative Sports Books, 1971.

11. Knapp, Barbara. Skill in Sport--The Attainment of Proficiency. London: Routledge and Kegan Paul, 1963.

12. Larson, Leonard and Rachel Yocom. Measurement and Evaluation in Physical, Health and Recreation Education. St. Louis: C. V. Mosby Co., 1951.

13. LaVeaga, R. C. Volleyball. 2nd ed. New York: Ronald Press, Cl., 1960.

14. Lay, Nancy and Ben Plotnicki. Volleyball. Dubuque, Iowa: Wm. C. Brown Co., Publishers, 1967.

15. Meyers, Carlton and Edwin Blesh. Measurement in Physical Education. New York: Ronald Press, 1962.

16. Mushier, Carole. Team Sports for Girls and Women. Dubuque, Iowa: Wm. C. Brown Co., Publishers, 1973.

17. Odeneal, William and Harry Wilson. Beginning Volleyball. Belmont, Calif.: Wadsworth Publishing Co., 1962.

18. Poindexter, Hally B. W., and Carole Mushier. Coaching Competitive Team Sports for Girls and Women. Philadelphia: W. B. Saunders Company, 1973.

19. Sandefur, Randy. Volleyball. Pacific Palisades, Calif.: Goodyear Publishing Co., 1970.

20. Scates, Allen. Winning Volleyball. Boston: Allyn and Bacon, 1972.

21. Scates, Allen and Jane Ward. Volleyball. Boston: Allyn and Bacon, 1969.

22. Schaafsma, Frances and Ann Heck. Volleyball for Coaches and Teachers. Dubuque, Iowa: Wm. C. Brown Co., Publishers, 1971.

23. Scott, M. Gladys and Ester French. Measurement and Evaluation in Physical Education. Dubuque, Iowa: Wm. C. Brown Co., Publishers, 1959.

24. Shay, Clayton (consultant). Skills Test Manual--Volleyball for Boys and Girls. Washington, D. C.: American Association for Health, Physical Education and Recreation, 1969.

25. Shondell, Donald and Jerre McManama. Volleyball. Englewood Cliffs, N. J.: Prentice Hall, Inc., 1971.

26. Slaymaker, Thomas and Virginia Brown. Power Volleyball. Philadelphia: W. B. Saunders Co., 1970.

27. Thigpen, Janet. Power Volleyball for Girls and Women. Dubuque, Iowa: Wm. C. Brown Co., Publishers, 1967.

28. Trotter, Betty Jane. Volleyball for Girls and Women. New York: Ronald Press Co., 1965.

29. Welch, Edmund. How to Teach and Play Volleyball. New York Associated Press, 1960.

B. PERIODICALS

30. Bassett, G., and R. Glassow, and M. Locke. "Studies in Testing Volleyball Skills," Research Quarterly, 8;20-77, December, 1937.

31. Brady, G. F. "Preliminary Investigation of Volleyball Playing Ability," Research Quarterly, 16:14-17, March, 1945.

32. Chapman, Nancy L. "Bump Ball for Beginners--A Basic Skill Progression for Classes," Division for Girls and Women's Sports Volleyball Guide, 73-75, 1973, pp. 26-28.

33. Clifton, Marguerite. "Single Hit Volley Test for Women's Volleyball," Research Quarterly, 33:208-211, May, 1962.

34. Crogen, Corinne. "A Simple Volleyball Classification Test for High School Girls," Physical Educator, 4:34-37, October, 1943.

35. Cunningham, Phyllis, and Joan Garrison. "High Wall Volley Test for Women's Volleyball," Research Quarterly, 39:486-490, October, 1968.

36. French, E. L., and B. I. Cooper. "Achievement Tests in Volleyball for High School Girls," Research Quarterly, 8:150-157, May, 1937.

37. Friermood, Harold T. "Volleyball Reflections--The First 75 Years," United States Volleyball Association Guide, 1970, pp. 144-149.

38. Helmen, Rute Maija. "Development of Volleyball Skill Tests for College Women," Division for Girls and Women's Sports Volleyball Guide, 71-73, 1971, pp. 47-53.

39. Johnston, J. N. "Progressive Volleyball Teaching," Athletic Journal, 49:48, March, 1969.

40. Kronqvist, Roger A., and Wayne B. Brumbach. "A Modification of the Brady Volleyball Skill Test for High School Boys," Research Quarterly, 39:116-120, March, 1968.

41. Ladner, Jane. "Volleyball Wall Volley Skill Test," Southern District Proceedings-American Association for Health, Physical Education, and Recreation, Biloxi, Miss., 1954.

42. Liba, Marie R., and Marilyn R. Stauff. "A Test for the Volleyball Pass," Research Quarterly, 34:56-63, March, 1963.

43. McManama, Jerre, and Don Shondell. "Teaching Volleyball Fundamentals," Journal of Health, Physical Education, and Recreation, 40:43-50, March, 1969.

44. Mohr, Dorothy R., and Martha Haverstick. "Repeated Volleys Test for Women's Volleyball," Research Quarterly, 26:179, May, 1955.

45. Plotnicki, Ben A. "Brief History of Volleyball," United States Volleyball Association Guide, 1965, p. 47.

46. Plunkett, Frances. "Let's Teach Strategy for Tournament Play," Division for Girls and Women's Sports Volleyball Guide, 65-67, 1965, p. 37.

47. Royal Canadian Air Force Pamphlet 95. "How to Play Better Volleyball," The Queen's Printer, Ottawa, Canada, 1963.

48. Russell, Naomi, and Elizabeth Lange. "Achievement Tests in Volleyball for Junior High School Girls," Research Quarterly, 11:33-41, December, 1940.

49. Scates, Allen. "Power Volleyball," Journal of Health, Physical Education, and Recreation, 44:32-39, October, 1973.

50. Shavely, Marie. "Volleyball Skills Tests for Girls," Selected Volleyball Articles, Division for Girls and Women's Sports Volleyball Guide, 1960, pp. 77-78.

51. Shondell, Donald S., and Jerre L. McManama. "Basic Fundamentals of Volleyball--A Progressive Teaching Approach," Division for Girls and Women's Sports Volleyball Guide, 71-73, 1971, pp. 36-41.

52. Shondell, Don, and Jerre McManama. "Volleyball Fundamentals and Techniques," Athletic Journal, 52:4, December, 1971, pp. 32-42.

53. Singer, Robert. "Sequential Skill Learning and Retention Effects in Volleyball," Research Quarterly, 39:185-194, March, 1968.

54. Thorpe, Sandy. "Volleyball Mini Unit for Junior High Girls," Division for Girls and Women's Sports Volleyball Guide, 71-73, 1971, pp. 71-77.

55. Ward, Jane. "Volleyball-A New Approach," Division for Girls and Women's Sports Volleyball Guide, 65-67, 1965, p. 32.

56. Watson, Mark. "Teamwork--The Key to Success," Division for Girls and Women's Sports Volleyball Guide, 71-73, 1971. pp. 24-29.

57. Welch, J. Edmund. "The Chest Pass is Dead?", Athletic Journal, 48:4, December, 1967, pp. 24-25, 41-42.

58. Women (S) Board of The Olympic Development Committee and Division for Girls and Women's Sports. Proceedings Fourth National Institute of Girls Sports, American Association for Health, Physical Education, and Recreation, Washington, D. C., 1968.

C. UNPUBLISHED MATERIAL

59. Blackman, Caludia. "The Development of a Volleyball Test for the Spike." Unpublished Master's thesis, Southern Illinois University, 1968.

60. Bosben, Patricia A. "The Development of a Skill Test for the Volleyball Bounce Pass for College Women Beginning Volleyball Players." Unpublished Master's thesis, Western Illinois University, 1971.

61. Chancy, Dawn S. "The Development of a Test of Volleyball Ability for College Women." Unpublished Master's thesis, Texas Women's University, 1966.

62. Cohen, Harlan S. "An Illustrated Study of Selected Drills for Coaches in Power Volleyball." Unpublished Master's thesis, Los Angeles State College, 1967.

63. Farrow, Bernice E. "Development of a Volleyball Selection Test Battery." Unpublished Master's thesis, Lamar State College of Technology, Beaumont, Texas, 1970.

64. Gorton, Beatrice. "Evaluation of the Serve and Pass in Women's Volleyball Competition." Unpublished Master's thesis, George Williams College, Downers Grove, Illinois, 1970.

65. Jackson, Patricia. "A Rating Scale for Discriminating Relative Performance of Skilled Female Volleyball Players." Unpublished Master's thesis, University of Alberta, Edmontin, Alberta, Canada, 1967. (Microfilm.)

66. Johnson, Judith A. "The Development of a Volleyball Skill Test for High School Girls." Unpublished Master's thesis, Illinois State University Normal, 1967.

67. Jones, Richard N. "The Development of a Volleyball Skills Test for Adult Males." Unpublished Master's thesis, Springfield College, Springfield, Mass., 1964.

68. Petry, Kathryn. "Evaluation of a Volleyball Serve Test." Unpublished Master's thesis, Los Angeles State College, Los Angeles, Calif., 1967.

69. Rauh, Sharon Lynn. "Comparison of the Open and Closed Hand Positions Used to Execute the Forearm Pass in Power Volleyball." Unpublished Master's thesis, Central Missouri State University, 1972.

70. Ryan, Mary Frances. "A Study of Tests for the Volleyball Serve." Unpublished Master's thesis, University of Wisconsin, 1967. (Microcard.)

71. Shaw, John. "A Preliminary Investigation of a Volleyball Skill Test." Unpublished Master's thesis, University of Tennessee, Knoxville, 1967.

72. Suttinger, Joan. "A Proposed Predictive Index of Volleyball Playing Ability for College Women." Unpublished Study, University of California at Los Angeles, May, 1967.

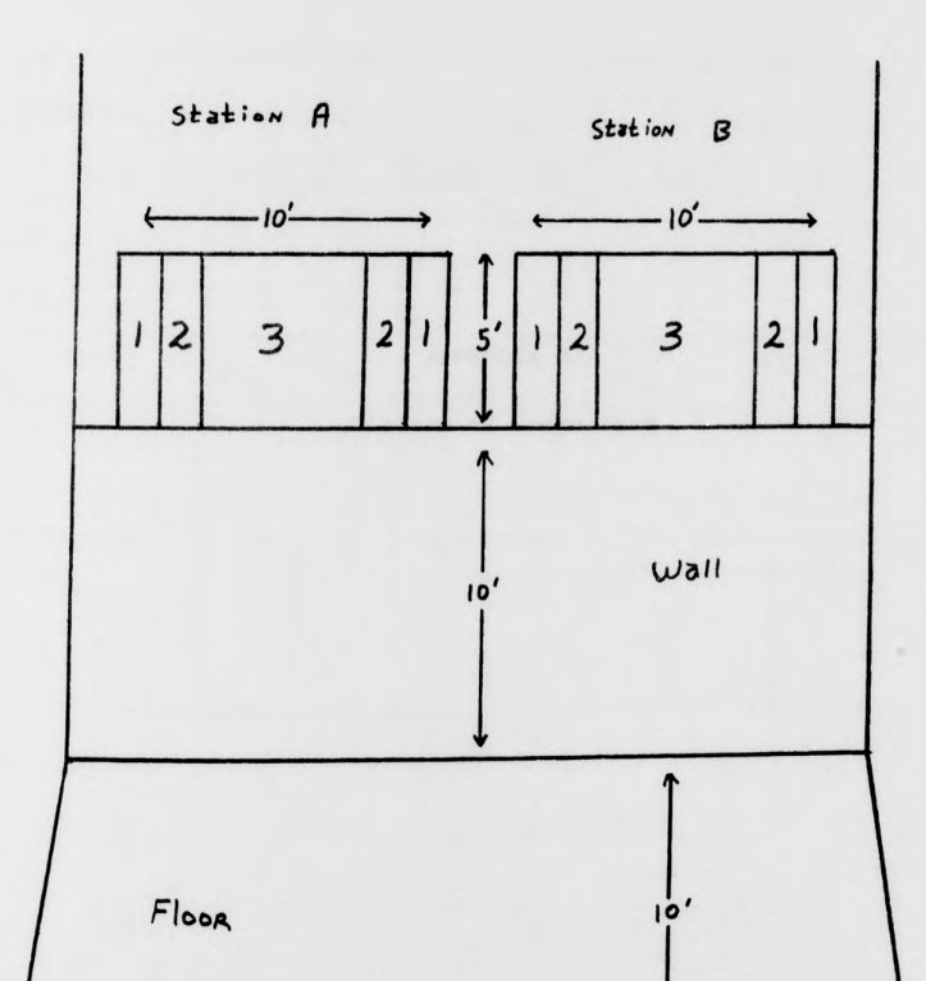
73. West, Charlotte. "A Comparative Study Between Height and Wall Volley Test Scores as Related to Volleyball Playing Ability of Girls and Women." Unpublished Master's thesis, The Woman's College of the University of North Carolina, Greensboro, June, 1957.

APPENDIXES

APPENDIX A

Diagram of Testing Station

DIAGRAM OF TESTING STATION



APPENDIX B

Diagram of Score Card

DIAGRAM OF SCORE CARD

NAME:					NUMBER:			
	TRIAL I		TRIAL III		Total I + III			
	TRIAL II		TRIAL IV		Total II + IV			
	1	2	3	4	5	6	7	Total
Judges' Ratings								

APPENDIX C

Suttinger's Rating Scale

SUTTINGER'S RATING SCALE

Criteria for Subjective Ratings

4 (Excellent)

Handles the ball with ease, using fingertips and displaying control over hits. Plays position well, moving out when necessary to make a save or to cover. Set-ups are high and accurate, the team play is very prominent. Placement and strategy in offensive play is evident, and spikes and blocks are usually successful. Rarely has trouble receiving serves, and rarely misplays the ball.

3 (Average to Good)

Has control over the ball but lacks the quality of ease. Plays position well, but isn't aggressive in backing up others. Team play is seen. Set-ups are usually high or accurate, and some indication of placement is seen in offensive play. Spikes and blocks are attempted, but with not too much success. Usually handles serves with no trouble.

2 (Poor to Average)

Skill in handling the ball is poor, especially noticeable on more difficult plays. Leaves position to play the ball, but some indication of team play is shown. Set-ups are attempted, but with not too much success. Placement is not indicated in offensive play. Erratic in handling serves.

1 (Poor)

Often unable to handle the ball, using fists or palms at times. Is continually out of or stationary in position. Negligible evidence of team play is seen. Set-ups seldom attempted and/or are unsuccessful. Offensive strategy is absent, with returns usually either unsuccessful or inconsistent.

APPENDIX D

Judges' Rating Sheet

JUDGES' RATING SHEET

Subject Number	1	2	3	4	5	6	7	8	9	10

JUDGES' NAME

NUMBER

3 = GOOD

2 = FAIR

1 = POOR

APPENDIX E

Raw Data

RAW DATA

Subject Number	Test Trials				Judges' Ratings						
	1	2	3	4	1	2	3	4	5	6	7
1	6	3	3	9	14	14	12	13	12	X	X
2	12	21	18	19	17	21	22	12	12	X	X
3	24	6	24	22	14	13	14	12	13	X	X
4	6	5	9	12	14	16	14	14	15	X	X
5	3	15	15	18	13	13	12	13	14	X	X
6	9	9	17	24	13	14	13	14	14	X	X
7	3	2	9	12	13	13	10	11	11	X	X
8	16	11	12	20	12	17	11	12	14	X	X
9	5	17	11	14	15	19	18	18	18	X	X
10	9	13	14	9	14	14	14	13	14	X	X
11	34	29	38	30	28	29	29	27	28	X	X
12	9	12	10	13	18	16	15	17	16	X	X
13	8	7	2	9	12	13	13	12	12	X	X
14	12	14	16	20	15	16	14	13	12	X	X
15	16	18	15	14	14	15	19	16	15	X	X
16	3	10	8	9	13	15	14	14	12	X	X
17	14	12	12	18	12	13	12	11	11	X	X
18	17	20	22	21	19	19	24	16	27	X	X
19	21	33	36	26	29	28	28	29	29	X	X
20	11	17	21	30	23	23	24	22	25	X	X
21	12	7	11	11	15	18	12	14	15	X	X
22	20	25	31	31	30	28	30	26	28	X	X
23	19	21	21	17	24	23	27	29	25	X	X
24	13	26	18	26	22	23	22	20	23	X	X
25	12	7	17	6	12	13	13	13	13	X	X
26	20	18	18	15	22	22	25	21	24	X	X
27	12	12	12	13	15	20	18	19	20	X	X
28	18	15	24	23	17	16	18	18	16	X	X
29	13	11	12	12	23	19	24	17	23	X	X
30	12	15	18	14	13	13	11	12	13	X	X
31	10	5	14	10	14	14	12	13	12	X	X
32	27	22	32	35	27	23	26	25	27	X	X
33	8	21	24	21	23	24	20	20	23	X	X
34	12	16	18	9	17	18	18	19	19	X	X
35	20	30	17	28	22	23	22	23	24	X	X

RAW DATA (continued)

Subject Number	Test Trials				Judges' Ratings						
	1	2	3	4	1	2	3	4	5	6	7
36	24	29	22	32	20	23	23	X	X	24	22
37	18	29	21	31	20	19	18	X	X	20	19
38	18	15	15	18	22	22	25	22	23	X	X
39	15	13	15	12	15	18	18	18	17	X	X
40	6	8	16	13	13	13	14	X	X	14	13
41	15	15	21	24	20	21	22	X	X	20	21
42	9	8	11	18	18	18	17	X	X	18	19
43	17	15	11	12	20	21	20	X	X	20	21
44	15	15	15	21	22	23	22	X	X	22	23
45	4	9	7	8	12	13	11	X	X	12	12
46	12	12	11	9	13	13	14	X	X	13	14
47	14	14	19	22	21	20	22	X	X	22	22
48	18	32	17	24	21	21	22	X	X	23	22
49	9	12	12	12	19	22	22	X	X	21	22
50	20	23	23	24	24	26	25	X	X	25	26
51	18	24	25	23	23	24	22	23	23	X	X
52	21	24	24	31	25	26	27	27	25	X	X
53	20	15	16	24	25	25	26	25	25	X	X
54	15	17	13	18	18	17	18	20	18	X	X
55	6	3	3	5	12	11	12	10	11	X	X
56	6	9	8	9	12	15	16	13	12	X	X
57	6	6	7	6	11	13	10	13	11	X	X
58	9	8	9	18	14	13	14	X	X	13	15
59	4	6	5	3	10	10	11	X	X	11	11
60	12	12	9	11	15	18	16	X	X	16	17
61	3	2	6	3	11	10	11	X	X	10	10
62	11	12	11	12	16	17	16	X	X	16	17
63	8	6	9	8	14	15	15	14	15	X	X
64	8	7	9	8	15	15	14	15	14	X	X
65	12	7	11	11	16	17	13	X	X	14	15
66	12	16	18	10	18	18	18	X	X	19	19
67	11	21	24	21	23	23	22	22	23	X	X
68	18	15	24	24	21	21	19	X	X	22	19
69	21	33	36	24	30	28	28	X	X	28	29
70	8	3	9	9	12	12	13	X	X	12	12

RAW DATA (continued)

Subject Number	Test Trials				Judges' Ratings						
	1	2	3	4	1	2	3	4	5	6	7
71	11	12	21	18	21	18	16	X	X	21	18
72	24	26	17	26	23	18	16	X	X	23	18
73	13	17	17	17	20	17	15	20	17	X	X
74	11	7	17	10	14	16	15	X	X	14	16
75	11	13	20	24	18	16	15	X	X	18	16
76	12	9	9	12	12	12	11	X	X	12	12
77	14	11	13	12	12	11	11	X	X	12	11
78	16	24	23	21	21	23	20	X	X	21	23
79	26	17	12	18	15	13	15	X	X	15	13
80	10	16	15	13	13	11	11	X	X	13	11
81	19	12	19	21	22	18	17	X	X	22	18
82	14	17	9	18	13	11	13	X	X	13	11
83	23	9	12	23	17	15	16	X	X	15	17
84	20	10	12	15	18	16	15	X	X	16	18
85	15	17	14	22	17	19	20	X	X	19	17
86	11	21	18	18	20	19	21	X	X	23	23
87	16	12	10	10	19	20	21	X	X	20	20
88	11	14	16	14	14	14	13	13	13	X	X
89	5	12	8	10	13	13	11	13	11	X	X
90	0	13	8	14	14	14	13	13	14	X	X
91	21	21	27	33	20	19	19	19	20	X	X
92	9	9	11	10	13	14	12	14	14	X	X
93	21	17	18	18	24	20	20	24	23	X	X
94	4	9	10	7	15	13	12	X	X	14	14
95	18	24	12	21	25	26	25	X	X	25	25
96	5	6	12	6	13	12	12	X	X	12	12
97	17	12	15	15	12	15	13	X	X	12	16
98	7	19	10	21	14	14	16	X	X	15	14
99	9	18	12	10	20	18	15	X	X	20	19
100	16	28	23	21	23	22	23	X	X	24	23