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A COMPARISON OF THREE INSTRUCTIONAL
METHODS ON THE IMPROVEMENT OF
SELECTED BADMINTON SKILLS

William Freddie Bradley

A dissertation presented to the
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in partial fulfillment of the requirements
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A COMPARISON OF THREE INSTRUCTIONAL
METHODS ON THE IMPROVEMENT OF
SELECTED BADMINTON SKILLS

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ABSTRACT

A COMPARISON OF THREE INSTRUCTIONAL METHODS ON THE IMPROVEMENT OF SELECTED BADMINTON SKILLS

by William Freddie Bradley

Statement of the Problem: The study was designed to compare the effects of a traditional method of instruction, a traditional method of instruction plus loop film observation without instructor feedback, and a traditional method of instruction plus videotape instant replay with instructor feedback on the improvement of selected skills in beginning badminton players.

Methods and Procedures: Subjects were sixty-four male and female students enrolled in three archery and badminton classes at Middle Tennessee State University. Classes were coeducational, conducted the Fall semester of academic year 1974-75, and taught by the investigator.

Each group was randomly assigned one of three treatments: Group I received the traditional method of instruction plus videotape instant replay each class; Group II received the traditional method of instruction plus loop film observation each class; Group III received the traditional method of instruction only. A group did not receive treatment assigned another group.

William Freddie Bradley

Classes met for fifty minutes, twice a week, at the same place, in consecutive hours, and for six weeks. Treatment time was five weeks. The investigator handled all aspects of each class with the exception of loop film projection and videotaping.

Badminton skill was determined by the cumulative score achieved by each student on two badminton tests, which were: (1) the Brumbach Short Serve Test, and (2) the Brumbach Clear Test. All aspects of the two tests were the same for pretest and posttest.

Findings: The analysis of variance for repeated measures was conducted since the F-ratio on pretest data showed no significant difference between groups. Analysis revealed significant skill improvement within each group but no significant difference between the groups. The .05 level of significance was used throughout.

Conclusion: It was concluded that although skill improvement was significant within each group, improvement could not be attributed to any particular treatment. Augmenting the traditional method of instruction with loop film observation or videotape instant replay did not add to or detract from skill improvement.

Recommendations: Based on the findings and limitations of this study, the following recommendations were made:

1. More coeducational studies should be conducted.

William Freddie Bradley

2. Assistance should be sought when using the videotape instant replay system but loop film projection assistance could be eliminated.

3. Loop film observation should take place in an area separate from the teaching-learning setting.

4. Studies with class meetings longer than fifty minutes should be conducted.

5. The videotape instant replay system should include a large screen monitor and slow-motion replay action when used in studies dealing with the acquisition or improvement of psychomotor skills.

6. The experience of the instructor should be evaluated.

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TABLE OF CONTENTS

	Page
LIST OF TABLES	vi
LIST OF FIGURE	vii
 Chapter	
I. INTRODUCTION	1
STATEMENT OF THE PROBLEM	5
PURPOSE OF THE STUDY	5
SIGNIFICANCE OF THE STUDY	6
DEFINITION OF TERMS	7
HYPOTHESES	8
LIMITATIONS OF THE STUDY	9
II. REVIEW OF RELATED LITERATURE	11
INTRODUCTION	11
GENERAL STUDIES RELATED TO FEEDBACK, KNOWLEDGE OF PERFORMANCE, AND KNOWLEDGE OF RESULTS	15
STUDIES OF FEEDBACK WITH SIGNIFICANT FINDINGS	20
STUDIES OF FEEDBACK WITH NON-SIGNIFICANT FINDINGS	23
STUDIES OF FEEDBACK WITH MIXED FINDINGS	30
SUMMARY OF RELATED LITERATURE	31

Chapter	Page
III. PROCEDURES	34
INTRODUCTION	34
OVERVIEW OF PROCEDURES	34
SUBJECTS	36
GROUP TREATMENTS	37
INSTRUCTIONAL PROCEDURES	39
SKILL TESTING PROCEDURES	41
LOOP FILM OBSERVATION	42
VIDEOTAPING PROCEDURES	43
STATISTICAL TREATMENT	45
IV. ANALYSIS OF THE DATA	47
DISCUSSION	49
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	56
SUMMARY	56
CONCLUSIONS	58
RECOMMENDATIONS	59
APPENDICES	61
A. STUDENT QUESTIONNAIRE	62
B. COURSE OUTLINE	63
C. DIAGRAM OF AREAS USED IN TEACHING, LOOP FILM OBSERVATION, AND VIDEOTAPE INSTANT REPLAY	66
D. TEST INSTRUCTIONS, PROCEDURES, AND SCORING	67

APPENDICES	Page
E. ATHLETIC INSTITUTE LOOP FILMS, PROJECTOR, AND SCREEN	73
F. RAW DATA	74
G. SCORE SHEET FOR SKILL TESTS	77
BIBLIOGRAPHY	78

LIST OF TABLES

Table	Page
1. ANALYSIS OF VARIANCE OF BADMINTON SKILL TESTS FOR GROUPS I (VIDEOTAPE), II (LOOP FILM OBSERVATION), AND III (TRADITIONAL)	48
2. "t" VALUES FOR BADMINTON SKILL IMPROVEMENT FOR GROUPS I (VIDEOTAPE), II (LOOP FILM OBSERVATION), AND III (TRADITIONAL)	49

LIST OF FIGURE

Figure	Page
1. MEAN SCORES FOR GROUPS I (VIDEOTAPE), II (LOOP FILM OBSERVATION), AND III (TRADITIONAL)	50

CHAPTER I

INTRODUCTION

Physical educators deal with a section of education which strives to determine the most meaningful and effective method of having students attain desired levels of psychomotor skills. Many factors enter into the final outcome as to the level of skill one can and will attain. Physical educators should seek those methods and practices which will assist them in becoming better teachers and for those aids which will assist students in understanding and attaining desired levels of psychomotor skills.

Smith states the following as important if the physical educator is to be an effective communicator:

know something about the theories of learning . . . have a knowledge of the nature of the learner as to sex, age, and intelligence as well as an understanding of the skill level of the learner . . . know what research has indicated for teaching regarding sex, age, and intelligence . . . (and) be aware of the importance of vision and perception in teaching motor skills.¹

The question of "what is effective" can be answered by each individual according to the individual's education, attitudes, beliefs, and interactions. Various audio-visual aids are available which may assist "effectiveness" in those dealing with motor skill development.

¹Barbara Bramlette Smith, "The Effectiveness of Television Video Tape Instant Playback in Learning the Pitch and Run Shot in Golf" (unpublished Doctoral dissertation, University of North Carolina at Greensboro, 1968), p. 1.

Knapp states, "students are motivated if they have knowledge of their progress, and thus learning advances at a faster pace."² Motivation appears to be significant in the psychomotor domain, as well as in the cognitive and affective domains.³

Because learning can be defined as "changed behavior that is not brought about by inborn responses, maturation, or temporary states of the organism,"⁴ it could be hypothesized that individuals who receive feedback concerning their performance and/or results might increase their learning, and thus their skill level. Responding to cues and information feedback relative to one's performance has long been of interest to physical educators. Through the response and feedback process one is able to determine what has been attained and what learning has taken place in relation to skill acquisition or skill development.

The term "feedback" has become highly used in physical education literature in the recent past. Various definitions have been given in order to pinpoint what

²Barbara Knapp, Skill in Sports: The Attainment of Proficiency (London: Routledge and K. Paul, 1966), p. 32.

³John D. Lawther, "Directing Motor Skill Learning," Quest, Monograph VI:68-76, May, 1966.

⁴Barbara Bramlette Smith, "The Effectiveness of Television Video Tape Instant Playback in Learning the Pitch and Run Shot in Golf" (unpublished Doctoral dissertation, University of North Carolina at Greensboro, 1968), p. 10.

feedback is and what purpose it serves. In one attempt to define feedback, Cooper states the following:

the process of providing information to the learner which thus provides cues, which, if translated correctly, should guide the learner in modifying his behavior toward the desired behavioral output.⁵

The importance of feedback information has been pointed out by various authors. Dunham states, "It is assumed that learning places an upper limit on performance. That is, performance does not exceed what has been learned."⁶ On the basis of Dunham's statement, the value of feedback as stated by Robb and by Bilodeau and Bilodeau becomes significant. Robb states, "one of the more important mechanisms involved in a skilled response is feedback."⁷ Bilodeau and Bilodeau concur by stating:

learning without KR (knowledge of results) has never yet been demonstrated, (and) we find progressive improvement the greater the number of trials followed by KR, deterioration with its removal, and response shifts with arbitrary shifts in KR.⁸

⁵Walter Elmore Cooper, Jr., "Videotape Replay Feedback in Learning Selected Gross Motor Skills" (unpublished Doctoral dissertation, University of Alabama, 1969), p. 10.

⁶Paul Dunham, Jr., "Learning and Performance," Research Quarterly, 42:334-337, October, 1971.

⁷Margaret Robb, "Feedback," Quest, Monograph VI: 38-43, May, 1966.

⁸E. A. Bilodeau and I. M. Bilodeau, "Variable Frequency of Knowledge of Results and the Learning of a Simple Skill," Journal of Experimental Psychology, 55: 379-383, 1958.

Lawther sums it up by stating, "the learner should obtain precise and prompt knowledge of results of his performance trials in order to progress most rapidly in learning."⁹

One relatively recent innovation in the providing of immediate feedback is the videotape "instant replay" system, familiar to those who observe televised sports of any kind. As stated, the greatest value of this process is that it is "immediate"; however, other advantages are that it requires no developing process, only one station is needed for recording and replay, self-analysis and group analysis can take place, and one can try to improve one's performance immediately after analysis in order to compare or note improvement.

Cratty points out, "Thus it seems that whenever possible visual cues in the form of films, demonstrations, or the like are superior to movement cues when learning skills."¹⁰ Because of Cratty's statement, it seems that repeated observation of skilled performances on loop film would be of more value than simple instructor analysis and verbal feedback without observation of skilled performance.

Much of the information available regarding the use of video feedback concerns "self-analysis" and thus does not make full use of the instructor. Also, most studies

⁹John D. Lawther, "Directing Motor Skill Learning," Quest, Monograph VI:68-76, May, 1966.

¹⁰Bryant J. Cratty, Movement Behavior and Motor Learning (Philadelphia: Lea & Febiger, 1964), p. 97.

dealing with feedback and the learning of psychomotor skills have not proved significant and thus do not point out the value of loop film and videotape assistance. In defense of non-significant findings, Kraft offers the following three points:

(1) a lack or absence of teacher feedback while utilizing videotape recording, (2) the inability of the learner to respond to the relative cues, or (3) the over-optimistic endorsement of videotape as an instructional tool.¹¹

STATEMENT OF THE PROBLEM

This study was designed to compare the effects of a traditional method of instruction, a traditional method of instruction plus loop film observation without instructor feedback, and a traditional method of instruction plus videotape instant replay with instructor feedback on the improvement of selected skills in beginning badminton players.

PURPOSE OF THE STUDY

The purpose of this study was to determine the effects of augmenting traditional instruction with selected audio-visual aids, with and without instructor feedback, on the improvement of selected skills in beginning badminton

¹¹Robert Eugene Kraft, "The Effects of Teacher Feedback Upon Motor Skill When Utilizing Videotape Recording" (unpublished Doctoral dissertation, Syracuse University, 1972), p. 4.

players. Physical educators only recently began to use videotape replay as feedback in basic instructional classes and related studies have shown a variety of findings as to its usefulness. This study sought to determine the effects of traditional instruction, loop film observation without instructor feedback, and videotape instant replay with the instructor actively involved in the provision of feedback.

SIGNIFICANCE OF THE STUDY

Studies involving the use of videotape instant replay, loop film, motion pictures, filmstrips, sequence cameras, and other extrinsic feedback have produced a variety of findings, especially when dealing with the acquisition and improvement of psychomotor skills in beginning players of various sport-related activities. While many investigators have attested to the beneficial assistance of loop film and videotape, few have achieved statistically significant levels of improvement. Studies involving videotape are relatively new and many have emphasized student "self-analysis." Instructor input has been limited or not used. The significance of the study centered around (1) the newness of videotape replay as an instructional tool in basic instructional classes in physical education, (2) an abundance of non-significant findings in related studies, and (3) the need for more instructor involvement in studies dealing with the acquisition and/or development of psychomotor skills.

DEFINITION OF TERMS

Badminton Skill. Badminton skill was defined as the individual cumulative score derived from the Brumbach Short Serve Test and the Brumbach Clear Test.

Beginning Badminton Player. A student who received no badminton instruction in high school, received less than six weeks of high school instruction, or who had not played on an organized team or club. Also, a student who met one of these criteria but still scored less than thirty-three (33) on the two tests was classified as a beginner.

Camera. That device which sent visual images to the videotape recorder to be recorded on magnetic tape.

Feedback. To use Robb's definition, feedback is "information which makes possible the comparison between output and a reference or standard."¹² For this study, feedback was the performance recorded on videotape plus any comment(s) given by the instructor. The standard was the desired individual stroke performances as stated in the class text.¹³

Instructor Feedback. Any response, critical analysis, or recommendation(s) for the improvement of skill issued in relation to an individual's performance.

¹²Margaret Robb, "Feedback," Quest, Monograph VI: 38-43, May, 1966.

¹³Margaret Varner Bloss, Badminton (Dubuque, Iowa: Wm. C. Brown Company Publishers, 1971), pp. 5-20.

Loop Film. One of a series of motion picture loops which contains demonstration and simple printed information related to desired individual performance.¹⁴ No narration or instructor feedback was available.

Monitor. A television-type screen used to view the videotaped performance of an individual class member.

Traditional Instruction. That instructional method utilizing lecture, demonstration, drill, and practice related to the various aspects of the course.

Videotape Recorder. That portion of the videotape system which contained the magnetic tape and equipment for transferring the visual image picked up by the camera and put on the magnetic tape for replay.

Videotape Replay. The process of playing back an individual's performance, recorded on magnetic tape, onto the monitor.

HYPOTHESES

This study investigated the following hypotheses:

H₁: A traditional method of instruction augmented by videotape replay with instructor feedback is significantly different than a traditional method in the improvement of psychomotor skills in beginning badminton players.

¹⁴The Athletic Institute, 1975 Catalog: Audio-Visual and Published Instructional Aids (Chicago, Illinois: The Athletic Institute, 705 Merchandise Mart, 1975), p. 11.

H₂: A traditional method of instruction augmented by loop film observation without instructor feedback is significantly different than a traditional method in the improvement of psychomotor skills in beginning badminton players.

H₃: A traditional method of instruction augmented by videotape instant replay with instructor feedback is significantly different than a traditional method of instruction augmented by loop film observation without instructor feedback in the improvement of psychomotor skills in beginning badminton players.

LIMITATIONS OF THE STUDY

1. The subjects in the study were sixty-four (64) male and female students enrolled in three archery and badminton classes during the Fall semester of the 1974-75 academic year at Middle Tennessee State University. All met the requirements of a beginning badminton player.

2. Methods of instruction were (1) traditional, (2) traditional augmented by loop film observation without instructor feedback, and (3) traditional augmented by videotape instant replay with instructor feedback. The videotape system was equipped with immediate replay and stop-action; however, slow-motion was not available. The loop film series was made available to members of the loop

film observation group. A checkout system was arranged for out-of-class use and rooms labeled "self learning centers" were available within the main physical education complex.

3. Treatment time was five weeks. All classes met on the same days, at the same place, twice a week, and for fifty minutes each class meeting.

4. All classes were tested in the same manner for both pretest and posttest, received the same class instructions, and were taught by the same instructor, the instructor being the investigator. Teaching, loop film observation, videotaping, and replay were in the same area.

5. No consideration was given to the time of day or the day of the week on which the classes were offered.

6. Present or previous athletic or activity skills were not considered except where direct involvement in badminton was concerned.

7. A method of instruction was assigned to each class by use of a table of random numbers.¹⁵ An F-ratio was used on the pretest data to determine if significant difference existed between the groups.

8. A t-ratio was conducted to determine skill improvement within each group while the analysis of variance was conducted to determine if significant difference existed between the groups.

¹⁵Herbert Arkin and Raymond R. Colton, Tables for Statisticians (New York: Barnes & Noble, Inc., 1963), pp. 158-161.

CHAPTER II

REVIEW OF RELATED LITERATURE

INTRODUCTION

In order for one to know the quality of a performance, the results of that performance must first be made available to the performer. This awareness of performance is referred to as feedback. Feedback can be given as knowledge of results (KR) or as knowledge of performance (KP). Knowledge of results denotes the sum total of a performance, such as a test score. Knowledge of performance gives the performer information concerning specific aspects of a performance, such as how each body part moved in a certain act. Throughout educational literature, authors have discussed the ramifications involved in how, when, why, and where to make feedback available to the performer in order to acquire maximum results.

Feedback can come in many forms and at almost any interval of time. There may be a continuous flow of feedback or results may be given on termination of one's performance. Comments may pertain to results only or to that which made up the performance. An individual may desire to view the performance and utilize "self-analysis" or take advantage of expert analysis and that of his/her peers. One may desire feedback so as to attempt some form

of improvement or simply to know the results of that particular performance. In classifying the types of feedback, Cooper states:

Feedback has been defined and classified in many ways. Feedback may be terminal (mere knowledge of results) or concurrent (immediate and continuous), internal and/or external, positive or negative and either verbal, visual, tactual, kinesthetic or possibly combinations of many sorts.¹⁶

Those who use feedback should not view it as a way of conditioning one to elicit a desired response but rather as a way of informing one of one's performance and/or results. Information thus received should provide the performer with cues as to those aspects of performance to be corrected so as to improve on a future performance or the number of points needed to attain a certain criterion level.

Feedback is defined in many ways by those who work with the development of psychomotor skills. Some authors are very specific with their wording, while others remain general in their choice of words. Robb offers a general definition in stating that feedback allows the learner to receive "information which makes possible the comparison between output and a reference or standard."¹⁷ The common

¹⁶Walter Elmore Cooper, Jr., "Videotape Replay Feedback in Learning Selected Gross Motor Skills" (unpublished Doctoral dissertation, University of Alabama, 1969), p. 21.

¹⁷Margaret Robb, "Feedback and Skill Learning," Research Quarterly, 39:175-184, March, 1968.

thread throughout many definitions is the point that after some form of verbal or physical response or performance, the individual receives an indication of correctness, accuracy, or adequacy, and will receive this information without undue delay.

The importance of immediate feedback to the learner is made by Lawther when he states, "Little or no learning takes place without knowledge of results or performance."¹⁸ Oxendine concurs with this statement and brings into view the role feedback plays in motivation by stating:

An awareness of one's performance is important in learning not only because of its inherent reinforcement values, but because it tends to motivate one to continue work on the task. Performance in any task is more meaningful when the learner is aware of his progress.¹⁹

A portion of the information necessary for the evaluation of a performance comes from our body through inherent senses, while other portions can be made available through sources not associated with the body. Hegmann says feedback from the body is intrinsic and "depends solely on the ability of the learners [sic] senses to identify the correctness of the movement, and the results thereof."²⁰

¹⁸John D. Lawther, The Learning of Physical Skills (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1968), p. 96.

¹⁹Joseph B. Oxendine, Psychology of Motor Learning (New York: Appleton-Century-Crofts, 1968), p. 57.

²⁰Edward Henry Hegmann, II, "The Effect of Videotape Viewing Training on Learning Tennis Skills When Utilizing Videotape Replay for Feedback" (unpublished Doctoral dissertation, Temple University, 1973), p. 10.

Information from sources not associated with the body is referred to as extrinsic and comes

from a source external to the learner . . . (and) provides augmented information to the learner that hopefully represents an accurate assessment of the consequences and quality of the motor movement.²¹

Other factors related to feedback are timing, type, amount, and correctness. Timing refers to whether feedback is concurrent (continual or on-going), terminal (given at the cessation of performance), or lapsed (given at certain intervals). Type refers to the method utilized in transferring the feedback. Types of feedback include verbalization, camera-graph-sequence, filmstrip, loop film, motion picture, audio tape, videotape, computer, or a combination of these and others. Amount refers to how much or how little feedback is given. Correctness refers to the specificity of feedback; that is, is the feedback specific to the task and is it properly presented. These factors are not inclusive but are common throughout the professional literature.

Authors conducting past studies have used the feedback factors just mentioned and have reported a variety of findings. Recent studies have tended to ignore the filmstrip, still camera, and motion picture. Emphasis now favors the loop film and videotape instant replay system. Teachers, researchers, coaches, and others involved in

²¹Ibid., p. 11.

developing motor skills are using these aids more and more, though the largest portion of educational studies reviewed show no statistical significance in favor of their use.

Many manipulative skills, sports skills, and physical activities have been performed and studied to determine the effect(s) of feedback, with and without the use of audio-visual aids. The following review will present information pertaining to feedback in general, knowledge of performance, and knowledge of results.

Studies conducted with the aid of loop film and videotape are presented as significant, non-significant, and mixed findings. The following categories are included:

GENERAL STUDIES RELATED TO FEEDBACK, KNOWLEDGE OF PERFORMANCE, AND KNOWLEDGE OF RESULTS; STUDIES OF FEEDBACK WITH SIGNIFICANT FINDINGS; STUDIES OF FEEDBACK WITH NON-SIGNIFICANT FINDINGS; STUDIES OF FEEDBACK WITH MIXED FINDINGS; and SUMMARY OF RELATED LITERATURE.

GENERAL STUDIES RELATED TO FEEDBACK, KNOWLEDGE OF PERFORMANCE, AND KNOWLEDGE OF RESULTS

Judd conducted one of the first studies involving knowledge of results. The study showed that performers did not learn when knowledge of results was withheld. Mere performance provided some knowledge of results.²²

²²C. H. Judd, "Practice Without Knowledge of Results," Psychological Review Monograph Supplements, 7:185-198, 1905.

Studies began to appear which concurred with the findings of Judd, but a question was raised as to what type of feedback would be most appropriate. Battig conducted a lever-positioning movement study in which he compared the utilization of visual, verbal, and kinesthetic feedback. The study showed the verbal feedback group superior in learning to the other groups.²³

Similar studies began to show varying results when different forms and combinations of verbal, visual, and kinesthetic feedback were used. In order to provide others with workable guidelines and general principles, Ammons surveyed the literature related to feedback and knowledge of performance and reported these eleven generalizations:

1. The performer usually has hypotheses about what he is to do and how he is to do it, and these interact with knowledge of performance.
2. For all practical purposes, there is always some knowledge of his performance available to the human performer.
3. Knowledge of performance affects rate of learning and level reached by learner.
4. Knowledge of performance affects motivation.
5. The more specific the knowledge of performance, the more rapid the improvement and the higher the level of performance.
6. The longer the delay in giving knowledge of performance, the less effect the given information has.

²³W. F. Battig, "The Effect of Kinesthetic, Verbal, and Visual Cues on the Learning and Acquisition of Lever Positioning Skills," Journal of Experimental Psychology, 47:371-380, 1954.

7. In the case of discontinuous tasks where knowledge of performance is given, small intervals between trials are generally better for learning than are longer ones.
8. When knowledge of performance is decreased, performance drops.
9. When knowledge of performance is decreased, performance drops more rapidly when trials are relatively massed.
10. Where subjects are not being given supplementary knowledge of performance by the experimenter any longer, the ones who maintain their performance level probably have developed some substitute knowledge of performance.
11. When direct (supplementary) knowledge of performance is removed, systematic "undershooting" or "overshooting" may appear in performance.²⁴

A variety of studies involving feedback, knowledge of performance, and knowledge of results followed the article by Ammons and studies began testing and probing the statements. Lincoln compared verbal feedback with intrinsic kinesthetic feedback in learning a rotary movement. Those learning the movement while receiving augmented verbal feedback were superior to those being augmented by intrinsic kinesthetic feedback.²⁵

In a study which provided students with two amounts of performance information, Smode found that those who

²⁴R. B. Ammons, "Effects of Knowledge of Performance: A Survey and Tentative Theoretical Formulation," Journal of General Psychology, 54:279-299, 1956.

²⁵R. S. Lincoln, "Learning and Retaining a Rate of Movement With the Aid of Kinesthetic and Visual Cues," Journal of Experimental Psychology, 51:199-204, 1956.

received the greater information were more motivated to succeed. Smode reasoned that when one is motivated, one concentrates more on the task at hand. Thus, according to the author, increased motivation promotes and increases learning.²⁶ Adams conducted a study which studied the relationship between learning and performance. The study dealt with regulating and reinforcing feedback. Adams concluded that regulating feedback may affect performance but does not necessarily affect learning.²⁷

Morford used a lever-positioning task to compare different types of feedback and found the following: (1) kinesthetic adjustment is not sufficient by itself in a dynamic kinesthetic motor task, (2) supplemented visual feedback improves both learning and subsequent performance, and (3) the greater the amount of visual feedback the more effective the results.²⁸

Turning their attention to the question of how soon feedback should be provided, Oxendine and Thompson tended to favor immediate feedback over any delay in feedback.

²⁶A. F. Smode, "Learning and Performance in a Tracking Task Under Two Levels of Achievement Information Feedback," Journal of Experimental Psychology, 56:297-304, 1958.

²⁷J. A. Adams, "Motor Skills," Annual Review of Psychology, ed. Paul Farnsworth (Palo Alto, California: Annual Reviews, Inc., 1964), pp. 181-202.

²⁸W. R. Morford, "The Value of Supplementary Visual Information During Practice on Dynamic Kinesthetic Learning," Research Quarterly, 37:393-405, October, 1966.

Oxendine states "to be most effective knowledge of results must be meaningful to the learner, specific in nature, and closely follow the performance."²⁹ Thompson utilized a traditional group and a group receiving "moment-to-moment" visual information feedback by way of a graph-check-sequence camera. The traditional group received feedback only once a week. Both groups were learning the golf drive and the approach shot with a five-iron. Thompson concluded that the immediate feedback group showed significant improvement in learning the drive and the approach shot.³⁰

Malina and Smoll provide information on the importance of specificity of feedback. Malina used four groups in determining the effect of differing types of feedback pertaining to speed and accuracy. Feedback to the four groups was classified as: (I) speed information but no accuracy information, (II) accuracy information but no speed information, (III) both speed and accuracy information, and (IV) no feedback information. Results of the study were: Group I showed improvement in speed but none in accuracy; Group II improved in accuracy but deteriorated in speed delivery; Group III showed significant improvement in both speed and accuracy; and Group IV showed

²⁹Joseph B. Oxendine, Psychology of Motor Learning (New York: Appleton-Century-Crofts, 1968), p. 58.

³⁰Donnis Hazel Thompson, "Immediate External Feedback in the Learning of Golf Skills," Research Quarterly, 40:589-594, October, 1969.

no improvement in either speed or accuracy. The author concluded that skill performance will improve or deteriorate according to the type of feedback and completeness of the feedback given and/or withheld from the performer.³¹ Smoll received similar results with five groups of fifteen subjects each. The task was to deliver a duckpin ball at a desired speed from a given distance. The group receiving the greatest and most specific information feedback made the most significant improvements. Groups had respective improvement or deterioration in task performance directly proportional to the amount and specificity of feedback.³²

STUDIES OF FEEDBACK WITH SIGNIFICANT FINDINGS

There are relatively few studies which reveal statistically significant findings in regard to the use of loop film and/or videotape as feedback and the improvement of psychomotor skills. Plese worked with two groups of junior high school students for a period of seven weeks on learning selected gymnastic skills. The study compared videotape replay with a traditional teaching method and

³¹Robert M. Malina, "Effects of Varied Information Feedback Practice Conditions on Throwing Speed and Accuracy," Research Quarterly, 40:134-145, 1969.

³²Frank L. Smoll, "Specificity and Delay of Information Feedback as Factors in the Learning of a Motor Skill," (unpublished Doctoral dissertation, University of Wisconsin, Madison, 1970).

achieved statistical significance beyond the .01 level. The experimental group progressed more rapidly than the control group. Also, forty-seven percent (47%) of the experimental group completed a gymnastic routine, while only twenty-six percent (26%) of the control group completed a routine.³³

DeBacy utilized female beginning golfers to determine the effects of videotape on self-assessment. She had one group view "model performances" of the motor skill, another viewed themselves and model performances, and a third group received only feedback showing themselves. It was concluded that viewing model performances and one's own performance with the aid of videotape feedback did significantly improve the accuracy of self-assessment.³⁴

Paulat conducted a study in which two groups of college males and females attempted to improve on hitting the tennis forehand drive. The two groups differed in that one utilized videotape replay as feedback, while the second viewed loop film models. Results were based on Hewitt's forehand drive skill test and a subjective rating by two expert judges. The findings showed a significant

³³Elliott Ray Plese, "A Comparison of Videotape Replay With a Traditional Approach in the Teaching of Selected Gymnastic Skills" (unpublished Doctoral dissertation, The Ohio State University, Columbus, 1967).

³⁴Diane Lee DeBacy, "The Effect of Viewing Videotapes of a Selected Sport Skill Performed by Self and Others on Self-Assessment" (unpublished Doctoral dissertation, The Ohio State University, Columbus, 1969).

improvement for the videotape group in learning the forehand drive. The group observing loop film models did not show significant learning.³⁵

Green achieved a significant difference at the .05 level between a videotape replay group and a control group, in favor of the videotape group, while teaching beginning swimming to college men. Three teachers and three judges were used to determine achievement in American National Red Cross swimming test items. Advanced beginners made greater progress in the test items than did the beginners.³⁶

Taylor studied the effect of various feedback treatments on the development of the swimming whip kick in college men. The three groups were: (1) no feedback, (2) verbal feedback, and (3) videotape feedback combined with verbal feedback. The group receiving videotape feedback combined with verbal feedback showed a significant improvement in learning from those receiving either verbal feedback or no feedback.³⁷

³⁵James Gustav Paulat, "The Effects of Augmented Videotaped Information Feedback and Loop Film Models Upon Learning of a Complex Motor Skill" (unpublished Doctoral dissertation, Stanford University, 1969).

³⁶William Bartell Green, "The Effectiveness of Television Replay as a Technique in Teaching Beginning Swimming Skills" (unpublished Doctoral dissertation, Brigham Young University, Provo, Utah, 1970).

³⁷Wayne Gilbert Taylor, "The Effectiveness of Instant Videotape Replay as a Source of Immediate Visual Feedback Upon Learning or Improving Performance of a Gross Motor Skill" (unpublished Doctoral dissertation, The University of Tennessee, Knoxville, 1971).

Beverley compared a traditional method with two methods of videotape replay in determining the effects on three groups of college beginning archers. Both methods of videotape replay proved statistically significant in relation to the traditional method of instruction. The group using videotape every day and the group using videotape every other day did not differ significantly. Although the author did not achieve significant difference in skill between the two videotape groups, there was a significant difference in form, favoring every day.³⁸

STUDIES OF FEEDBACK WITH NON-SIGNIFICANT FINDINGS

Gray and Brumbach utilized sixty college males in determining the effect of loop film on the learning of selected badminton skills. Two of the four classes received standard lecture-demonstration instruction and were augmented with loop film observation twice each class period, from the second to the fifth week. After the fifth week, observation was optional. Class members were tested the first, sixth, and tenth week. Only the experimental group showed significant gains by the sixth week. Since there were significant differences between the groups at the sixth week but not at the tenth week, the authors concluded that value from loop film observation was more

³⁸Leah Beverley, "The Effects of Instant Videotape Feedback in Learning Target Archery" (unpublished Doctoral dissertation, University of Southern Mississippi, 1973).

noticeable in a short period of time and that differences between groups became less after a period of time simply because of participation within the class.³⁹

Gasson examined the effectiveness of television instant replay on teaching beginning badminton to college students in coeducation classes. Although improvement was achieved by both groups, no significant difference was shown between groups on initial, final, or improvement scores.⁴⁰

Harless studied improvement in selected motor skills using the traditional method of instruction and the traditional method of instruction augmented by videotape replay. Skills included the overhead forehand clear in badminton, the full swing using middle distance irons in golf, and the forehand ground stroke in tennis. A panel of judges determined scores for each individual. The analysis of variance revealed no significant difference between the groups for any selected motor skill.⁴¹

³⁹Charles A. Gray and Wayne B. Brumbach, "Effect of Daylight Projection of Film Loops on Learning Badminton," Research Quarterly, 38:562-569, December, 1967.

⁴⁰Ivo S. H. Gasson, "An Experiment to Determine the Possible Advantages of Utilizing Instant Television for University Instruction in Badminton Classes" (unpublished Master's thesis, The University of Washington, Seattle, 1967).

⁴¹Ivan Luther Harless, "A Comparison of Improvement of Selected Motor Skills Utilizing Two Instructional Methods" (unpublished Doctoral dissertation, The Louisiana State University and Agricultural and Mechanical College, 1969).

Cooper used fifty-four (54) seventh grade boys in determining the effects of videotape feedback in learning four fundamental basketball skills. The five groups were: (a) auditory feedback only, (b) videotape feedback only, (c) a combination of auditory and videotape feedback, (d) no auditory feedback, and (e) a control group. The findings did not show significant differences for any group. Although non-significant findings were shown, the investigator concluded that adequate practice was necessary and videotape feedback seemed to be a desirable supplement when teaching skills dependent upon form and accuracy.⁴²

Penman, Bartz, and Davis used two groups of college freshmen in examining the effects of teaching beginning trampoline skills with and without a videotape instant replay system. Evaluation was by a jury of three people. Analysis of data revealed no significant difference between the groups. The investigators concluded the following: (1) practice time for the videotape group was decreased because of watching the videotape replay, and (2) videotape instant replay seemed more valuable when working with remedial and above average students.⁴³

⁴²Walter Elmore Cooper, Jr., "Videotape Replay Feedback in Learning Selected Gross Motor Skills" (unpublished Doctoral dissertation, University of Alabama, 1969).

⁴³Kenneth A. Penman, Douglas Bartz, and Rex Davis, "Relative Effectiveness of an Instant Replay Videotape Recorder in Teaching Trampoline," Research Quarterly, 39: 1060-1062, December, 1968.

James used two groups to determine the effects of videotape feedback in learning selected skills related to beginning trampoline. Findings were non-significant at the .05 level. The investigator stated the following: (1) self assessment can be better developed when the instructor is utilized, and (2) future studies should observe the rate of learning over a fixed period of time.⁴⁴

Cox used college freshman males in examining the effect of two instructional strategies in teaching seventy-five (75) complex wrestling skills. The group taught by a continuous concept sequence strategy did not differ from the group taught by a discrete concept sequence strategy. Also, the use of videotape did not act as a significant stimulator for the subjects to learn.⁴⁵

Caine used two groups of men and women beginning bowlers to compare a traditional method of instruction and the traditional method augmented by videotape replay. The videotape replay group utilized videotape replay one day a week for ten (10) weeks. The findings showed no statistically significant difference in bowling scores between the group taught with the aid of videotape replay and the

⁴⁴P. E. James, "Video Feedback in Learning Beginning Trampoline," Perceptual and Motor Skills, 32: 669-670, 1971.

⁴⁵Kenneth Melvin Cox, "An Experiment in Teaching Complex Motor Skills to University Freshman Male Students Using Continuous and Discrete Concept Sequences With and Without Instant Videotape Replay" (unpublished Doctoral dissertation, University of Washington, 1969).

group taught by traditional method. Although no significant difference was reported, the investigator commented that videotape replay has much to offer physical education. The difficulty is learning how best to utilize the videotape instant replay system.⁴⁶

Hoff used videotape replay to augment the conventional method of instruction in bowling. Subjects were seventy-eight (78) male and female college students. Findings showed no significant difference in scores between the conventional method and conventional method augmented by videotape replay. No difference occurred between the men, women, experienced, or beginning bowlers. It was concluded that videotape replay is a valuable medium in learning but should be used only as an aid to the teacher and the teaching situation.⁴⁷

Polvino used seventy-nine (79) college women classified as beginning bowlers to investigate the effects of videotape replay in bowling. The three groups were: (1) experimental with videotape, (2) experimental with videotape and illustrations, and (3) control. The analysis

⁴⁶John Ernest Caine, "The Effect of Instant Analysis and Reinforcement of Motor Performance Through the use of Cinematography Techniques Related to Television" (unpublished Doctoral dissertation, Colorado State College, Greeley, 1966).

⁴⁷Donald Joseph Hoff, "A Comparison Between Videotape and Conventional Method of Instruction in Bowling" (unpublished Doctoral dissertation, University of Utah, Salt Lake City, 1969).

of data revealed significant improvement within each group but no significant difference between the three groups.⁴⁸

Weiss used women beginning golfers to determine the difference between three instructional methods: (1) no videotape feedback, (2) immediate videotape feedback, and (3) delayed videotape feedback. The test was conducted six weeks after treatment began and consisted of one's ability to drive a golf ball with a five-iron. No significant difference was found between the three groups.⁴⁹

Smith investigated the effectiveness of television videotape instant playback in learning the pitch and run shot in golf. Four methods of instruction were used but no significant differences were found. Students indicated, however, they had a better understanding of the task after viewing their performance on videotape.⁵⁰

Armstrong studied the effect of videotape instant feedback on learning, rate of learning, and form as compared to a standard lecture-demonstration instructional

⁴⁸Geraldine Joyce Polvino, "The Relative Effectiveness of Two Methods of Video Tape Analysis in Learning a Selected Sport Skill" (unpublished Doctoral dissertation, The University of Iowa, Iowa City, 1971).

⁴⁹Elma Steck Weiss, "The Value and Use of Instructional Television in Teaching Women Beginning Golfers" (unpublished Doctoral dissertation, Arizona State University, Tempe, 1971).

⁵⁰Barbara Bramlette Smith, "The Effectiveness of Television Video Tape Instant Playback in Learning the Pitch and Run Shot in Golf" (unpublished Doctoral dissertation, University of North Carolina at Greensboro, 1968).

method. A total of fifty-four (54) students participated in the study and eighteen (18) were randomly selected for final treatment. The findings showed the use of videotape instant visual feedback did not significantly affect the learning, rate of learning, or form in this study. The investigator commented that videotape instant visual feedback seemed to enhance the motivation of students within the treatment group.⁵¹

Hegmann conducted a study to determine if students could benefit more from videotape viewing by first being taught what to look for and how to find it. In other words, the study attempted to train students how to look at videotape. By using videotape replay as augmented feedback in training the students, the investigator sought to determine the effect of videotape viewing training on learning prescribed movement patterns in the stroking and serving motions in tennis. Subjects were fifty-six (56) college students in beginning tennis classes. While viewing training enabled students to focus on specific performance aspects and improve, instructor feedback did not significantly affect the quality of movement.⁵²

⁵¹Wayne Jackson Armstrong, Jr., "The Effects of Videotape Instant Visual Feedback on Learning Specific Gross Motor Skills in Tennis" (unpublished Doctoral dissertation, University of Southern Mississippi, 1971).

⁵²Edward Henry Hegmann, II, "The Effect of Videotape Viewing Training on Learning Tennis Skills When Utilizing Videotape Replay for Feedback" (unpublished Doctoral dissertation, Temple University, 1973).

STUDIES OF FEEDBACK WITH MIXED FINDINGS

Because studies have more than one goal or one factor to work with, many times mixed findings result. Mixed findings can be beneficial if utilized correctly; however, findings of this kind can also be misused. To extract selected findings from a study of mixed findings is neither fair or beneficial to the researcher or the author. This section contains findings which were found to be truly mixed.

Kraft used experienced bowlers and the methods of teacher feedback, videotape feedback, and a combination of the two to determine the effects upon bowling skill. The findings revealed a significant difference between groups in the improvement of bowling skill at the .05 level in favor of the combination teacher feedback and videotape group. However, there was no significant difference in bowling skill between the teacher feedback group and the videotape self-analysis group.⁵³

Del Rey used college women to determine the effects of videotape feedback on form, accuracy, and latency during acquisition of skill in a modified form of the classical fencing lunge. The results indicated videotape significantly improved the form of movement, regardless of the

⁵³Robert Eugene Kraft, "The Effects of Teacher Feedback Upon Motor Skill When Utilizing Videotape Recording" (unpublished Doctoral dissertation, Syracuse University, 1972).

environmental conditions. In terms of form and latency, significance at the .05 level was shown in the use of videotape, environmental certainty, and testing periods. In terms of accuracy, only the main effects of environmental certainty were significant.⁵⁴

Matthews used two groups of forty (40) male and female college students to determine the effectiveness of videotape recording in teaching the golf swing. The test consisted of hitting for accuracy and distance with the seven iron. The findings showed the females improved significantly but no significant improvement occurred in the male group.⁵⁵

SUMMARY OF RELATED LITERATURE

Although no study or other piece of literature cited refutes the advantages of feedback to the performer, it is clear that no method or combination of methods can assure positive results. Also, no activity can assure significant results through the use or nonuse of loop film observation, videotape replay, or combination.

⁵⁴Patricia Del Rey, "The Effects of Video-taped Feedback and Environmental Certainty on Form, Accuracy, and Latency During Skill Acquisition" (unpublished Doctoral dissertation, Columbia University, 1970).

⁵⁵Edsel Lee Matthews, "The Effectiveness of Videotape Replay as an Adjunct in Teaching the Golf Swing" (unpublished Doctoral dissertation, University of Utah, Salt Lake City, 1971).

Many investigators agree that loop film and videotape are, or could be, beneficial to those involved in the teaching and development of psychomotor skills. The problem is in learning how best to use each method. Baker and Young, after working with videotape as a means of feedback, suggest that:

motor skills be analyzed and broken into smaller units before videotape feedback can be expected to reveal itself as a significant development factor in the learning of motor skills.⁵⁶

Both loop film and videotape replay offer the opportunity to work with smaller and more specific movements or parts of movements.

Advantages and disadvantages have been offered by investigators and students concerning the use of loop film, videotape, and other forms of audio-visual assistance. Students in a study conducted by Mackey stated these as advantages of videotape: (1) the close-up shot allowed them to see better than in the usual position, and (2) the small screen held their attention better. Disadvantages were stated as being: (1) the tape speed, (2) oversimplification of the tape, (3) lack of opportunity to ask questions, and (4) the lack of enforced attention.⁵⁷

⁵⁶C. H. Baker and P. Young, "Feedback During Training and Retention of Motor Skills," Canadian Journal of Psychology, 14:257-264, 1960.

⁵⁷Richard T. Mackey, "Sports Skills Lessons on Television," Journal of Health, Physical Education, and Recreation, 39:31-32, May, 1968.

While findings of the studies reviewed make it clear that the stressing of self-analysis by students without instructor feedback has not been effective in the learning of psychomotor skills, it is still not clear what effect instructor feedback has upon videotape analysis and the development of psychomotor skills. A few authors strongly suggested using the instructor as a feedback source, while others stated instructor input had little or no effect on skill improvement.

Instructors have had various roles in studies involving feedback. Some of the roles have been as (1) an observer while students participated in self-analysis, (2) a motivator, and (3) an active participant in the analysis and feedback process. The number of studies using the instructor as an active participant in the analysis and feedback process has been small and it is to this point that interest for the present study developed.

CHAPTER III

PROCEDURES

INTRODUCTION

The purpose of this chapter is to present the procedures used in the obtaining and treatment of data for this study. In order to clarify this information, the following categories are provided: OVERVIEW OF PROCEDURES, SUBJECTS, GROUP TREATMENTS, INSTRUCTIONAL PROCEDURES, SKILL TESTING PROCEDURES, LOOP FILM OBSERVATION, VIDEOTAPING PROCEDURES, and STATISTICAL TREATMENT.

OVERVIEW OF PROCEDURES

The study was conducted at Middle Tennessee State University during the Fall semester of the 1974-75 academic year. Classes were three archery and badminton classes taught by the investigator. Classes met for fifty minutes, twice a week, on the same days, at the same place, and in consecutive hours. Subjects were those students who registered for one of the three classes and who were classified as beginning badminton players. Treatment time, the time between pretest and posttest, was five weeks.

One group received the traditional method of instruction, consisting of lecture, demonstration, drills, practice, and play. A second group received the

traditional method of instruction plus the observation of loop film without instructor feedback each class. A third group received the traditional method of instruction plus videotape instant replay with instructor feedback and analysis each class.

"Badminton skill" for each class member was determined by the cumulative score derived from two badminton skill tests. The two skill tests were the Brumbach Short Serve Test and the Brumbach Clear Test (Reliability of .91 and Validity of .83).⁵⁸ A pretest was administered the first day of the badminton segment of the course. Prior to the pretest, class members were given verbal and visual information regarding racket grip, the layout of each test, and testing procedures. A posttest was administered five weeks later in the same location, at the same times, and in the same testing order.

An F-ratio was conducted on pretest data to see if groups were similar in badminton skill. A t-ratio was conducted on group data to determine skill improvement within each group while the analysis of variance for repeated measures was conducted on all collected data to determine significant difference between groups.

⁵⁸Charles A. Gray and Wayne B. Brumbach, "Effect of Daylight Projection of Film Loops on Learning Badminton," Research Quarterly, 38:562-569, December, 1967.

SUBJECTS

Subjects for the study were sixty-four (64) male and female students, between the ages of seventeen (17) and twenty-five (25), enrolled in three archery and badminton classes during the Fall semester of 1974-75 at Middle Tennessee State University. The three classes were taught by the same instructor, the instructor being the investigator. All students used in the study were classified as beginning badminton players and received five weeks of badminton instruction. Students were made aware of their role in the study and assured that their participation would not count towards their final grade.

A questionnaire (Appendix A) was filled out by each student the first day of the semester which gave the investigator information concerning each student's age, sex, college classification, and badminton experience. With the aid of the questionnaire and the pretest data, students were classified as beginning badminton players by meeting one of the following criteria: (1) having received no previous badminton experience or instruction, (2) having received less than six weeks of previous badminton instruction, or (3) attaining a cumulative score of thirty-three (33) or less after indicating prior experience or instruction in badminton.

The importance of meeting class was explained to each student, not from the standpoint of grade but because

of possible elimination from the study. All students were informed that there were two ways of being eliminated from the study: (1) not take either the pretest or posttest, or (2) miss more than two days of class. The pretest and posttest were given on specified days but any student who missed one of these days could take the tests no later than the next class period and still be included in the study. For posttest purposes, since classes were officially over that day, a student had two days in which to make up the missed tests. Absences were used as a criteria for elimination because a student would be missing vital instruction and information with each missed class.

GROUP TREATMENTS

Each group was given a number prior to the assigning of a treatment to each by use of a table of random numbers.⁵⁹ Group number, class time, and treatment assignment are as follows:

Group I. 11:00 - 11:50 a.m.: Traditional method plus videotape instant replay with instructor feedback.

Group II. 12:00 - 12:50 p.m.: Traditional method plus loop film observation without instructor feedback.

Group III. 1:00 - 1:50 p.m.: Traditional method.

⁵⁹Herbert Arkin and Raymond R. Colton, Tables for Statisticians (second edition. New York: Barnes & Noble, Inc., 1963), pp. 158-161.

Group III received the traditional method of instruction only, therefore subgrouping was not necessary. Members of groups I and II were divided into subgroups by use of a table of random numbers.⁶⁰ Each group, consisting of five or six students, was given a number and assigned, by use of a table of random numbers,⁶¹ to a rotation system which placed it at the treatment area once each class. The rotation system permitted loop film observation and/or videotape instant replay to take place while the remaining class members continued with lesson plans for the day. The investigator worked with class members while each subgroup was observing loop film or being videotaped since assistance was received from people not associated with the classes. The investigator returned to the videotape instant replay subgroup only after taping and rewinding of the tape had been completed. Consistency was observed concerning the rotation system, the amount of time spent observing each loop film, and the amount of time spent on each group being videotaped and analyzed.

All groups were given set instructions at the beginning of each class for a period of time not exceeding ten minutes. This instruction was given so that the core of instruction for each class, at the start of class, would be the same. After this instruction, each group would

⁶⁰Ibid., pp. 158-161.

⁶¹Ibid., pp. 158-161.

break into small groups and follow lesson plans for that day. The traditional group went through drills, played games, participated in tournaments, or engaged in some "off-court" activities. Members of this group never observed loop film nor were they videotaped. The group augmented by loop film observation would break into subgroups and go through a regular class, each subgroup rotating to the loop film observation station once each class. Members of this group were never videotaped. The group augmented by videotape instant replay would break into subgroups and go through a regular class, each subgroup rotating to the videotape instant replay station once each class. This group never observed loop film.

INSTRUCTIONAL PROCEDURES

Instructions, demonstrations, corrections, and testing for all classes, as well as analysis and feedback in the videotape instant replay group, were provided and/or supervised by the investigator. One assistant was used in the loop film observation group and two assistants were used in the videotape instant replay group. All classes received basic instructions at the beginning of each class according to lesson plans prepared in advance by the investigator. This was done as a precautionary measure to provide each class equal coverage with respect to all lectures and demonstrations. Loop films and procedures for videotaping were also prearranged to insure coordination

between the three groups. Areas and materials covered, loop film observed, and skill performances videotaped are presented in the course outline in Appendix B.

Classes met in the Alumni Memorial Gymnasium which contained four badminton courts situated side by side. Adequate distance on all sides and above was available. Due to lack of additional space and to eliminate difficulty in class management, loop film observation and videotape instant replay were conducted within this area. No difficulty or additional problems were witnessed by the instructor due to this situation. A diagram of the meeting area, loop film observation area, and videotape instant replay area is presented in Appendix C.

Classes met twice a week, fifty minutes per class, and for a period of six weeks. Treatment time, that time between pretest and posttest, was five weeks. The traditional group was not augmented by loop film observation or videotape instant replay, only the instructor feedback common to that traditional lecture-demonstration class. The group observing loop film observed one loop film appropriate to each day's lesson. Each subgroup observed two circuits of the loop, each loop being from three minutes and forty seconds to three minutes and forty-eight seconds in length. An assistant, from outside the classes, was assigned to show the loops and to keep track of the circuits observed. The videotape instant replay group members were taped while performing three trials of

the skill presented that day or a previous day. Immediately after each member of a subgroup was taped, that subgroup reported to the replay station and observed the tape while the instructor analyzed each performance and made comments pertaining to errors and their correction. Strong points for each student performance were also pointed out and analyzed. Feedback was given in two forms and at two times: (1) verbally as the performance was being observed on replay, and (2) verbally and with demonstration at the end of the replay session. Although a small variance could not be avoided, the amount of time spent in analyzing and correcting was equalized.

SKILL TESTING PROCEDURES

Two badminton skill tests were used to determine each class member's skill level. Brumbach developed the Brumbach Short Serve Test and the Brumbach Clear Test to assist in determining an individual's skill in executing a fine psychomotor skill and a skill exhibiting body control and power.⁶² Pretest and posttest data were formed by adding the test scores in order to obtain one cumulative score for each individual. Test instructions, scoring, and procedures appear in Appendix D.

⁶²Wayne B. Brumbach, Badminton Skills and Fitness Tests (University of Oregon: School of Health, Physical Education, and Recreation, 1968).

The pretest was conducted during the first class meeting of the badminton segment of the course, while the posttest was conducted at the end of the five week treatment period. Testing procedures were the same for the pretest and posttest.

Test directions were read to each group prior to the administration of the pretest and posttest. Each test allowed each class member one trial of twelve (12) shots. The ten highest scores on each test were used to determine each individual's score on each of the two tests. A random listing of class members in each group, per test, was made prior to the pretest and was followed during the administration of the posttest.

LOOP FILM OBSERVATION

Group II received loop film observation without instructor feedback in addition to the traditional method of instruction. Class members were randomly assigned to subgroups of five or six students. A random order of rotation was made at the beginning of the semester and followed throughout the treatment time. An assistant was assigned to show the loop film each day and to keep track of the number of circuits observed.

Beginning with the second class meeting of the badminton segment of the course and lasting five consecutive weeks, twice a week, a loop film appropriate to that day's lesson plan was observed by each subgroup. The place

for loop film observation was consistent throughout the treatment time (see Appendix C). The projector and screen were placed on the floor with the screen against the wall. Students were seated on the floor and in a semicircle. All equipment used in this section of the study were products of The Athletic Institute and are listed in Appendix E.

According to the rotation chart, each subgroup rotated from place to place during each class period. The loop film observation station required approximately seven minutes of time per group per day. After observing the loop film, each subgroup rotated back into the class setting and continued with the day's lesson plan. Each subgroup rotated to the loop film observation station once each day.

The loop film observation group was informed that any or all of the loops used in class could be checked out for out-of-class observation. Three rooms, labeled "self learning centers" were available within the main physical education complex.

VIDEOTAPING PROCEDURES

Group I received videotape instant replay with instructor feedback in addition to the traditional method of instruction. Class members were randomly assigned to subgroups of five or six students. A random order of subgroup rotation was determined at the beginning of the semester and was followed throughout the treatment time.

According to the rotation chart, a subgroup reported to the videotaping station and was seated next to the wall on the court opposite the side on which the person being taped was located. Subgroup members were taped in a set order and then were directed to and seated at the replay area. At the replay area, class members observed the tape and received instructor analysis and feedback. After analysis and feedback, the subgroup returned to the courts to continue with the day's lesson plan and another subgroup reported to the taping area. All subgroups were taped and received analysis and feedback each class.

The videotape instant replay system used is a product of the Concord Communications Systems. The Portable Video Tape Recorder (model VTR-460) was used for all taping and replay. The recording unit featured instant playback and still-action but did not have slow-motion. Features of the camera (model TCM-46) consisted of hand-operated zoom and focus and a start-stop trigger for ease of tape control. Features of the monitor (model MR-750) were ease of handling and a nine-inch diameter picture tube. Only Concord recording tape specified for this system was used throughout the treatment time.

The videotape system was located three feet behind the back boundary line of court one (see Appendix C) and in line with the right side boundary line. The person being taped was located on the opposite side of the court and facing the camera; thus, a front view was taken of each

class member. The camera lens was set at a height of five feet from the floor and the zoom was fixed so as to include a full-body shot of each class member. All parts of the videotape system and accessories were situated on one table. One chair per person was located in a semicircle at the table containing the replay system.

STATISTICAL TREATMENT

Members of each class were those who registered for one of three archery and badminton classes taught by the investigator during the Fall semester of the 1974-75 academic year at Middle Tennessee State University. Methods of instruction were assigned at random to the three classes.

Underwood and others discuss the realistic necessity of using those available intact classes which are common in the educational setting. This saves the instructor from having to assign students to treatment groups after a period of pretesting.⁶³

The .05 level of significance was the acceptable level used throughout. An F-ratio was conducted on pretest data to determine significant difference between groups. Since no significant difference existed, the analysis of variance was conducted on collected data to determine if

⁶³Benton T. Underwood, and others, Elementary Statistics (New York: Appleton-Century-Crofts, 1968), pp. 144-145.

significant difference existed between the three groups. Raw data for the traditional method of instruction, the traditional method of instruction plus loop film observation without instructor feedback, and the traditional method of instruction plus videotape instant replay with instructor feedback is presented in Appendix F.

CHAPTER IV

ANALYSIS OF THE DATA

The purpose of this chapter was to report the findings of data collected in relation to improvement of badminton skill test scores from three instructional methods. Subjects were classified as beginning badminton players according to scores obtained from the Brumbach Short Serve Test and the Brumbach Clear Test. Results on the two tests formed a cumulative score for each class member for the pretest and posttest.

Group data were analyzed by conducting the analysis of variance with repeated measures on the pre/post factor. Methods of instruction used in the study were: (1) the traditional method only, (2) the traditional method plus loop film observation without instructor feedback, and (3) the traditional method plus videotape instant replay with instructor feedback.

Using the .05 level of significance as the acceptable level, the analysis of data showed significant skill improvement within all groups. However, analysis revealed no significant difference between the groups. This information is presented in Table 1.

Significant skill improvement did occur in all groups from pretest to posttest; however, this improvement cannot be attributed to any group treatment since the

TABLE 1

ANALYSIS OF VARIANCE OF BADMINTON SKILL TESTS
FOR GROUPS I (VIDEOTAPE), II (LOOP FILM),
AND III (TRADITIONAL)

Source	SS	df	MS	F
<u>Between Ss</u>	18056.50	63		
groups	721.80	2	360.90	1.27 *
error (b)	17334.69	61	284.17	
<u>Within Ss</u>	4997.00	64		
Pre/Post	1953.12	1	1953.12	40.51 **
groups X Pre/Post	103.09	2	51.54	1.07
error (w)	2940.78	61	48.20	
Total	23053.50	127		

* F for P of .05 = 3.15

** F for P of .05 = 4.00

traditional method group proved as significant as either the loop film observation group or the videotape instant replay group. Skill improvement for each group is illustrated in Table 2.

TABLE 2

"t" VALUES FOR BADMINTON SKILL IMPROVEMENT
FOR GROUPS I (VIDEOTAPE), II (LOOP FILM),
AND III (TRADITIONAL)

Instructional Group	N	Sum of d_i	Sum of d_i^2	t
I	23	231	4374	4.984
II	21	121	1744	3.649
III	20	148	3830	2.758

I: t for P of .05 = 2.074
II: t for P of .05 = 2.086
III: t for P of .05 = 2.093

Mean scores for each group on pretest and posttest are given in Figure 1. Skill score ranges revealed significant skill improvement within each group but no significant difference between groups.

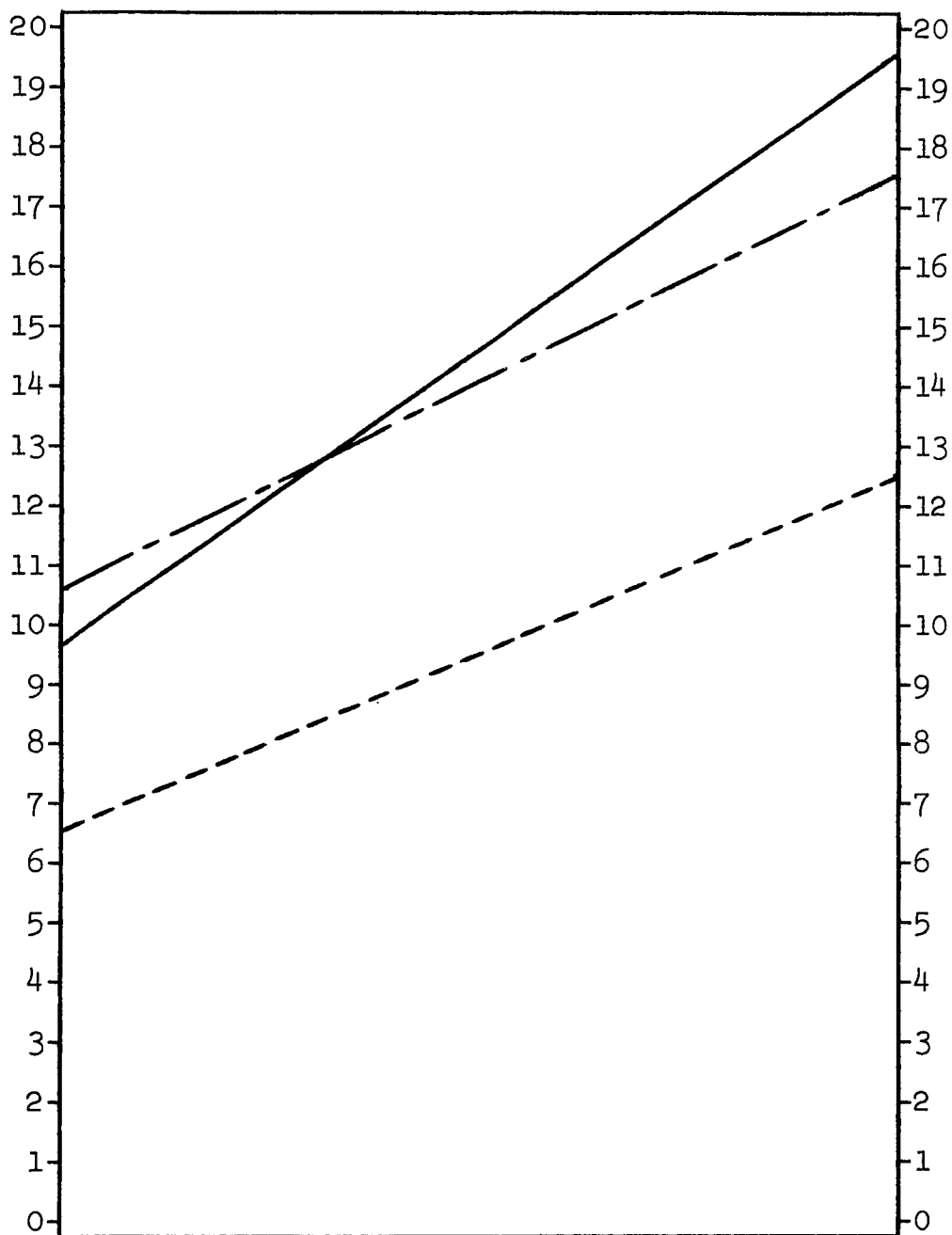
DISCUSSION

A review of the related literature revealed a high percentage of non-significant findings when audio-visual aids were utilized in the acquisition or retention of motor skills. Many authors studied the effect(s) of loop film

FIGURE 1

MEAN SCORES FOR GROUPS I (VIDEOTAPE),
II (LOOP FILM), AND III (TRADITIONAL)

PRETEST POSTTEST



Group I (Videotape) : _____
Group II (Loop Film) : - - - - -
Group III (Traditional) : - - - - -

and/or videotape replay on student "self-analysis," with the instructor having little or no input. Individual feedback varied in timing (concurrent, lapsed, terminal), type (verbalization, still picture, motion picture, audio tape, video tape, loop film, filmstrip, and others), and amount so that no common variable could be determined. Also, few studies have used coeducational groups in the acquisition, improvement, or retention of psychomotor skill with audio-visual assistance as part of the feedback.

This study involved males and females in similar coeducational situations with all students being tested for skill improvement by a common set of tests. Because males and females are normally tested by different skill tests in badminton, this study differed slightly from the standard class or testing situation. Since the trend in colleges and universities throughout the United States is toward coeducational physical education classes, this type of study might well be considered more in the future. Tests dealing with psychomotor skills should be developed in all areas of activity with consideration given to those in a coeducational setting.

Findings of this study revealed significant skill improvement within the three groups but no significant difference between the groups. Improvement within the treatment time might have been attributed to simply attending and participating in class and not to any particular treatment. Because the loop film observation

group and the videotape instant replay group showed significant skill improvement, the inclusion of either method of audio-visual assistance did not add to or detract from the traditional method of instruction.

So the reader may better understand each instructional situation, certain aspects directly related to each class are presented. Both positive and negative aspects are presented so the reader may decide which aspects were influential and which need to be eliminated in future similar studies.

Time allowed for activity classes varies to a degree from one institution to another and instructors must work within this limitation. A time allotment of fifty minutes may be inadequate to conduct a study involving videotape instant replay, even though assistance may be available. Even though significant skill improvement did occur within the fifty minute allotment, full benefit from videotape utilization might better be realized with a slightly longer time period per class. A time period of one hour and fifteen minutes may be more desirable for studies using videotape instant replay in the improvement of psychomotor skills.

Instructions per class and the sequence of events presented in the course outline (Appendix B) were believed adequate and well understood. Rapport within each class was not consistent between the instructor and students. Rapport was not too good with the loop film observation

group, good with the traditional group, and excellent with the videotape instant replay group. The sequence of classes, time of day, repetition of instructions, and different students were factors to be considered but no particular factor seemed stronger than the other when compared to the rapport listing.

The number of positive and negative aspects of the traditional group were less than those of the other two groups. Since no subgroups were made in the traditional group and no specified rotation system was used during class, all four courts were used during practice and play. The instructor was not concerned with returning to or checking on a specific station and thus could devote more personal time in contact with each student. Personal instruction and correction, along with aforementioned factors, may have been conducive to the excellent rapport reported between the instructor and this group.

The loop film observation group was divided into subgroups and rotated to an area located off the courts for loop film observation. This left all four courts open for practice and play each class. An assistant, not associated with classes, was used to run the loop film projector and count the number of circuits observed. Each investigator using loop film in a similar future study should reconsider the worth of such an assistant as this investigator found such an assistant unnecessary. Almost without exception each student voiced the opinion that

observing the loops was boring. It would be difficult to attribute this boredom to any particular factor. One very interesting point to mention is no member of this group utilized the out-of-class checkout system for observing loop film. Boredom and/or disinterest from observation of the loops while in class may have caused this lack of usage. Factors for consideration are the nature of the activity, no instructor input, length of each loop, the number of circuits, and possibly others.

The videotape instant replay group was divided into subgroups and rotated onto court one each class period. This left only three courts free for practice and play each class period. Two assistants, from outside the classes, were used in keeping the correct taping order and in taping each performance. These assistants proved necessary in the operation of the videotape system and future investigators should consider such assistance. Students in this group stated instructor feedback helped them in noticing errors and in the correction of such errors. Consideration should be given as to the amount of time used in taping and tape replay since time spent in such a manner is time not spent practicing. Many students voiced an interest in all aspects of the videotape system but added slow-motion would have been more interesting than simply stop-action.

An important aspect to consider in future studies is the experience of the instructor. This investigator had been involved in teaching in the basic instruction program

at the higher education level for seven years when this study was undertaken. Consideration should be given to the ability of the instructor to transfer thoughts and meanings through verbalization and demonstration due to years of experience and involvement. Because the beginning instructor may lack verbal or technical skills necessary to be "effective," various forms of feedback and the use of different types of audio-visual assistance may be useful. This consideration does not infer that the experienced instructor, especially one involved in the development of psychomotor skills, cannot benefit from such aids when used at the appropriate time. Nor does it infer that all beginning instructors would find it necessary to use such assistance to be considered "effective" or to be considered a "good teacher."

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to determine the effectiveness of augmenting traditional instruction with loop film observation without instructor feedback and videotape instant replay with instructor feedback on the improvement of badminton skill. Skill tests included the Brumbach Short Serve Test and the Brumbach Clear Test.

SUMMARY

Subjects for this study were sixty-four (64) male and female beginning badminton players in three archery and badminton classes at Middle Tennessee State University during the Fall semester of the 1974-75 academic year. The same instructor taught all classes, the instructor being the investigator. Classes were held at the same place, twice a week, for fifty minutes each meeting, and in consecutive hours. Groups I (Videotape), II (Loop Film), and III (Traditional) consisted of twenty-three, twenty-one, and twenty subjects, respectively.

Each student completed a questionnaire at the beginning of the semester in order to aid the investigator in determining those who would be classified as beginning badminton players. During the first meeting of the badminton segment of the course, the pretest was administered to each group. The pretest consisted of the

Brumbach Short Serve Test and the Brumbach Clear Test. A cumulative score for each student was derived by adding the two test scores. Any student not classified as a beginning badminton player, according to information given on the questionnaire, who attained a cumulative score of thirty-three (33) or less was classified as a beginning player. A treatment time of five weeks (ten classes) followed the pretest, after which the posttest was administered. Posttest procedures and scoring were the same as those for the pretest.

Students registered for the class of his/her choice with no consideration given previous activity except where badminton was directly involved. Classes were numbered prior to the assigning of group treatments by a table of random numbers. The three groups were as follows:

Group I. 11:00 - 11:50 a.m.: Traditional method plus videotape instant replay with instructor feedback.

Group II. 12:00 - 12:50 p.m.: Traditional method plus loop film observation without instructor feedback.

Group III. 1:00 - 1:50 p.m.: Traditional method.

Members of groups I and II were assigned to subgroups by a table of random numbers; however, subgroups were not necessary in group III. Each subgroup consisted of five or six students and was rotated to a specified station each class meeting. Students in the videotape instant replay group were videotaped each day while performing a skill appropriate to the day's lesson. Each

videotaped skill performance consisted of three trials performed in succession. Members of the loop film observation group observed a loop film appropriate to the day's lesson for two circuits. After completing the day's skill performance or observing the assigned loop film, members of a subgroup rotated back into the class for completion of the day's lesson.

An analysis of variance for repeated measures on pre/post factor revealed significant skill improvement within all groups but did not reveal a significant difference between the three groups. Skill improvement, although significant within all groups, could not be attributed to any particular treatment.

CONCLUSIONS

On the basis of the findings revealed by the analysis of collected data, the following conclusions were made:

Hypothesis 1. A traditional method of instruction augmented by videotape replay with instructor feedback is significantly different than a traditional method in the improvement of psychomotor skills in beginning badminton players. This hypothesis was rejected because no significant difference was revealed between these two groups.

Hypothesis 2. A traditional method of instruction augmented by loop film observation is significantly different than a traditional method in the improvement of

psychomotor skills in beginning badminton players. This hypothesis was rejected because no significant difference was revealed between these two groups.

Hypothesis 3. A traditional method of instruction augmented by videotape replay with instructor feedback is significantly different than a traditional method of instruction augmented by loop film observation without instructor feedback in the improvement of psychomotor skills in beginning badminton players. This hypothesis was rejected because no significant difference was revealed between these two groups.

RECOMMENDATIONS

Based upon findings and limitations of this study, the following recommendations are made:

1. More studies dealing with the acquisition and improvement of psychomotor skills should be conducted in the coeducational setting. All phases of the basic instruction program in physical education should be included.
2. Studies should be conducted in situations where class time exceeds fifty minutes to determine whether such audio-visual aids differ significantly.
3. Assistance should be sought when using the videotape instant replay system; however, consideration should be given to the value of an assistant in a loop film observation situation.

4. The area designated for loop film observation should be located so class and outside distractions will not interfere with those viewing the loop(s).

5. The videotape instant replay system should include a large screen monitor and slow-motion replay action when used in studies dealing with the acquisition or improvement of psychomotor skills.

6. An evaluation should be made of the experience of the instructor in teaching psychomotor skills.

APPENDICES

APPENDIX A

STUDENT QUESTIONNAIRE

Name: _____

Age, in years: _____

Classification at MTSU: Fr. Soph. Jr. Sr.

How many years have you played badminton: (check one)

NOTE: at least six weeks of instruction denotes one year

- A. I have never received instruction: _____
- B. One year: _____
- C. Two years: _____
- D. Three years: _____
- E. Four years: _____
- F. Five years: _____
- G. More than five years: _____

Did you receive at least a six weeks unit of badminton instruction in high school? Yes No

Have you ever played on an organized badminton team?

Yes No

If yes, the name of the team: _____

How many years were you on the team? _____

Have you ever been a member of an organized badminton club?

Yes No

If yes, the name of the club: _____

How many years were you a member? _____

APPENDIX B

COURSE OUTLINE

Traditional: Group III	Videotape: Group I	Loop Film: Group II
Class 1: Pretest. Brumbach Short Serve Test and Brumbach Clear Test	Pretest	Pretest
Class 2: Forehand grip, ready position, and footwork; delivery of low short serve. Drills: low short serve; 1/2 court set- clear; clear-clear.	Low Short Serve	C-4: Low Short Serve
Class 3: Review class 2; demonstrate and discuss high deep clear; introduce high deep serve. Drills: low short serve; short serve- underhand clear; low short serve-clear- clear; high deep serve; rally.	Low Short Serve	C-4: Low Short Serve
Class 4: Review high deep clear and drop shot; discuss high deep serve; discuss procedure for scoring in singles and doubles. Drills: clear-clear; high deep serve; rally.	High Deep Serve	C-3: High Deep Serve
Class 5: Review clear, drop, high deep serve, and scoring; introduce the smash. Drills: high deep serve; high deep serve-clear; clear- drop; drop-drop; rally.	High Deep Serve	C-3: High Deep Serve

Traditional:
Group III

Videotape:
Group I

Loop Film:
Group II

Class 6: Review class 5; discuss the smash; go over the procedure for start of game. Drills: drop-drop; 1/2 court set-drop; 1/2 court set-smash; rally. Games.

Smash from 1/2 court

C-8:
Forehand Overhead Shots:
Smash - Drop

Class 7: Discussion on rules pertaining to serving and receiving, changing sides of court, setting of score; methods of play; introduce drive shot. Drills: clear-clear; 1/2 court clear-smash; rally. Games

Overhead Clear

C-7:
Forehand Overhead Shots:
Defensive Clear and Attacking Clear

Class 8: Discussion on rules pertaining to faults; review scoring in doubles and methods of play; discuss drive shot. Drills: drop-underhand clear; rally. Games.

Underhand Clear at Net

C-11:
Drive Shots:
Underhand Clear Shots

Class 9: Review of rules with question-answer period; review footwork with body control; give distinction between shots and returns to use against each. Drills: footwork with body and racket control; 1/2 court set-drive; drive-drive; drive-drop; rally. Games.

Footwork with body and racket control while performing the deep overhead clear

C-7:
Forehand Overhead Shots:
Defensive Clear and Attacking Clear

Traditional:
Group III

Videotape:
Group I

Loop Film:
Group II

Class 10: Review the distinction between shots and returns for each; discussion on how to add power and deception to shots; reminder of posttest. Class Tournament.

Drop Shot return C-12:
of Smash while at Net Shots
the net

Class 11: Review of areas for knowledge test; question-answer period on rules; reminder of posttest tomorrow. Class Tournament.

Drop Shot from
3/4 court

C-8:
Forehand Over-
head Shots:
Smash - Drop

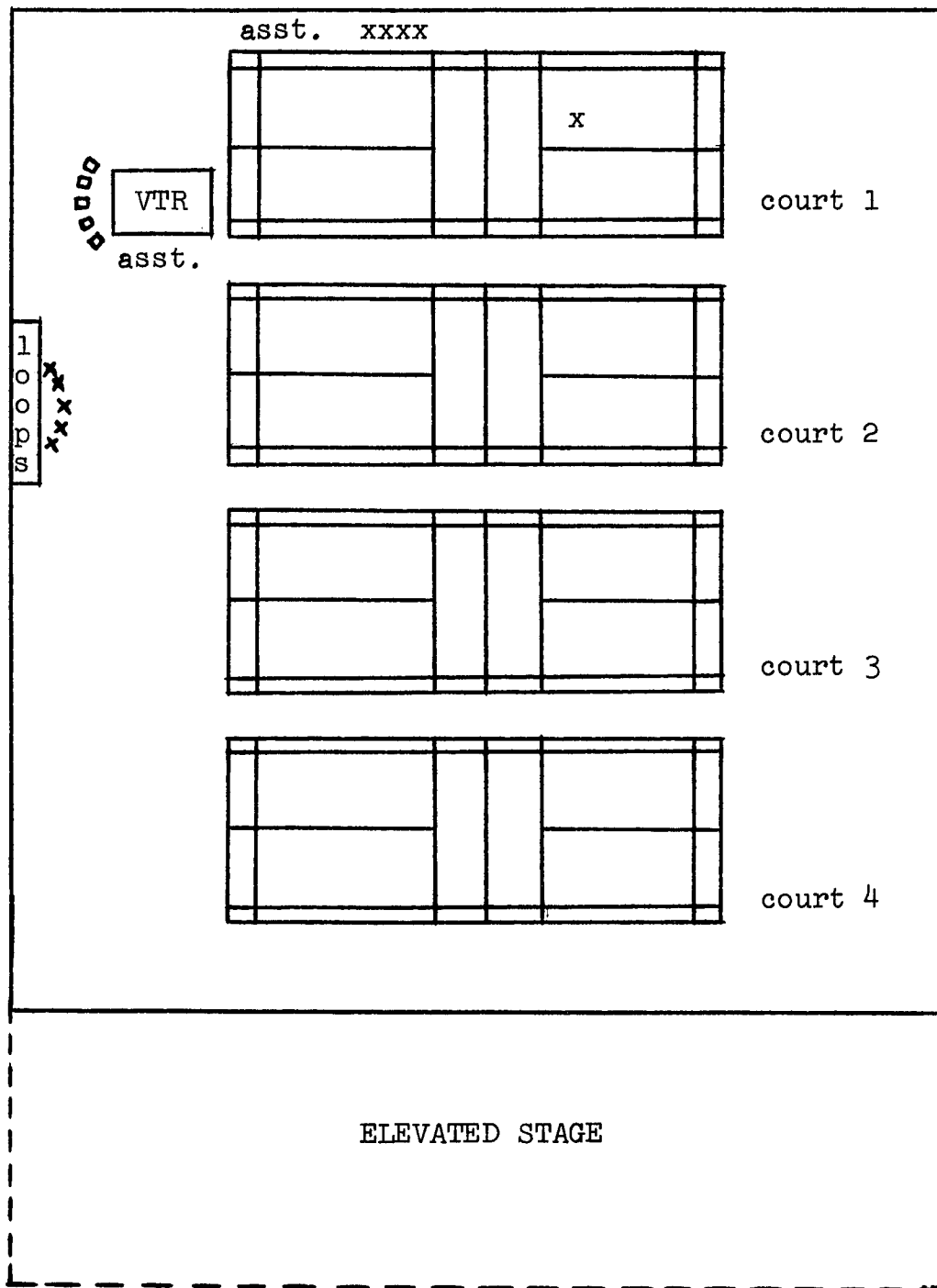
Class 12: Posttest
Brumbach Short Serve
Test and Brumbach
Clear Test

Posttest

Posttest

APPENDIX C

DIAGRAM OF AREAS USED IN TEACHING, LOOP FILM
OBSERVATION, AND VIDEOTAPE INSTANT REPLAY



APPENDIX D

TEST INSTRUCTIONS, PROCEDURES, AND SCORING

Brumbach Short Serve Test:

A. Equipment:

1. Twelve new shuttlecocks and one good racket.
2. A piece of light rope to be strung 17 inches directly above the net and parallel to it.
3. A piece of chalk for marking target zones.
4. A clipboard, pencil and sheet for recording the scores.
5. A chair or stool for holding the shuttlecocks.

B. Test:

1. The student being tested will stand in the right court if he/she is right handed, the left court if left handed. The student may serve from any place in that court except that he/she may be no closer to the short service line than one racket length.
2. The student will serve into the diagonally opposite court.
3. In order that the service may be officially scored, the shuttlecock must go over the net but under the rope strung 17 inches above the net and fall into one of the scoring zones.

C. Scoring:

1. No score is awarded for any shuttle which fails to go over the net, goes above the rope over the net or which fails to land in the scoring zones of the proper service court.
2. The score is awarded according to where the "tip" of the shuttlecock hits.
3. Shuttlecocks falling on lines between zones are given the higher of the two point values.
4. Points earned on illegal serves do not count. The shuttlecock is to be reserved.
5. A service which touches the rope but passes under it will not count as one of the official attempts but will be reserved.
6. If, while serving toward the target area, the shuttlecock misses the target area but strikes elsewhere within the service court, the shot shall score one point.

D. Additional Personnel:

1. One student to pick up the shuttlecocks as soon as they have been scored.

2. Two students to watch the rope above the net and to call "over" for shuttlecocks that go over it.
3. One student to record the scores.

E. Instructions to read to the students:

You are to be tested on your ability to make the short service. You will be allowed twelve shots but only the best ten will count toward your score.

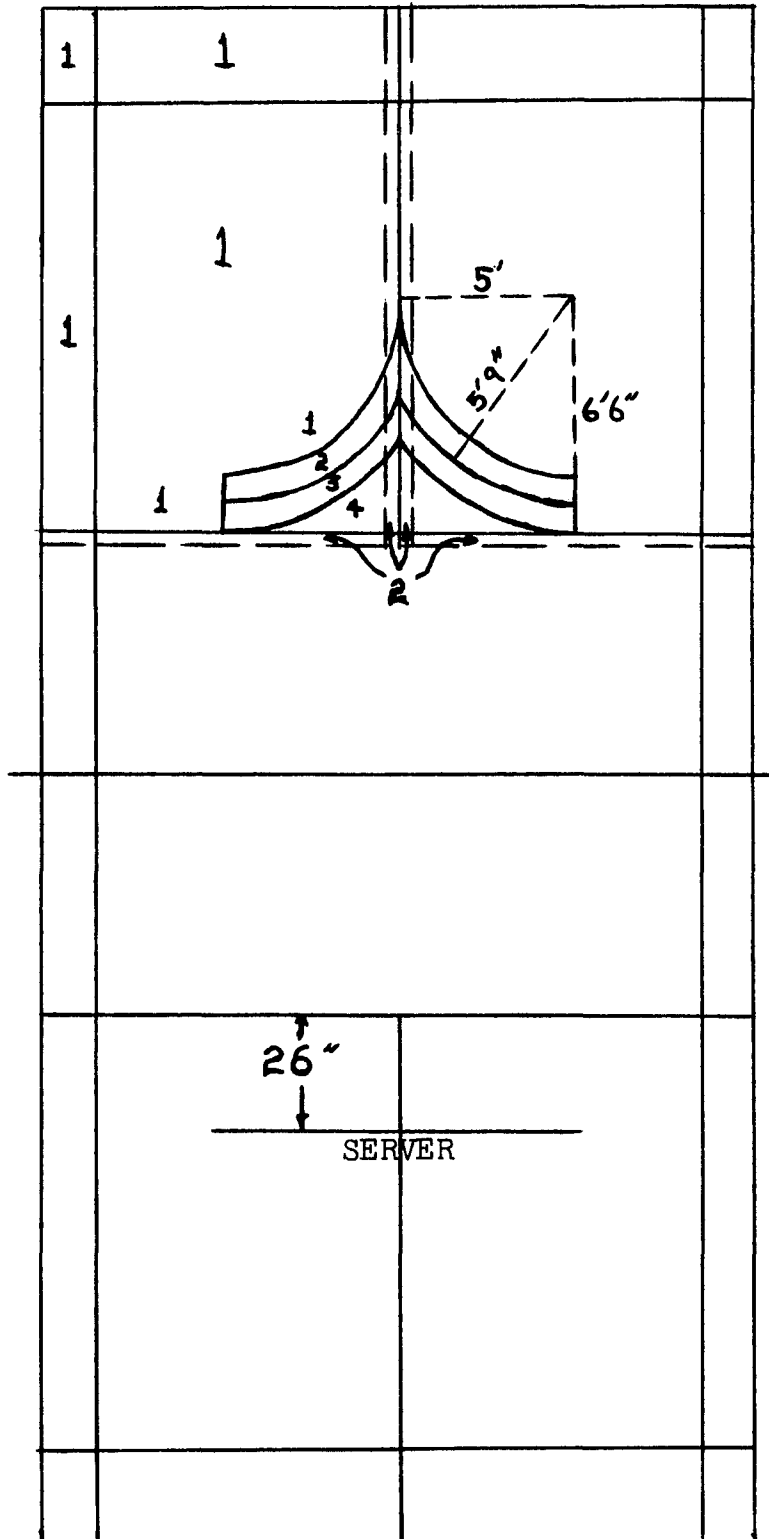
You will serve from the right court if right handed or left court if left handed and you may serve from any place in that court provided you are behind the chalked line back of the short service line.

You will attempt to serve the shuttlecock in a legal manner so it crosses the net but goes under the rope 17 inches above the net and lands in the designated zones.

Every shuttlecock at which you swing will count as one of your ten shots. Any shuttlecock failing to go over the net, going out of bounds, going over the rope or falling short of the line in front of the short service line will score no points. Shuttlecocks hitting the rope and falling between the rope and net will be reserved. Shots will be scored as follows:

1. Three inch zone in front of the short service line 2 pts
2. Corner zone 4 pts
3. First semicircular zone 3 pts
4. Second semicircular zone 2 pts
5. Any shot landing within the proper court but not within a designated zone 1 pt

Layout for the Brumbach Short Serve Test:



Brumbach Clear Test:

A. Equipment:

1. Twelve new shuttlecocks and two good rackets.
2. An extra badminton net to be strung across the court at the clearing height of nine feet--two inches.
3. A piece of chalk for marking values on the zones.
4. A clipboard, pencil and sheet for recording the scores.
5. A chair or stool for holding the shuttlecocks.

B. Test:

1. The student being tested will be stationed in the three feet by six feet box in the court on the opposite side of the net from the scoring zones.
2. The instructor, or person doing the testing, will be located across the net from the student and on the short service line.
3. The instructor will serve the shuttlecock to the student so he/she can hit it with an overhead stroke. The student will attempt to clear every shuttlecock hit to him/her. The instructor, however, will rule out all shots which pull the student out of the designated box. The student must have at least one foot in the box at the time he/she hits the shuttlecock. In addition, the instructor may rule out any other shot which he/she feels is not a fair trial. All shots hitting the ceiling will not be scored, but will be redone. None of these shots will count against the student's total.
4. As soon as the serve is hit, the student is free to move as he/she wishes. The student is to attempt to send the shuttlecock, with an overhead clear stroke, over the net and into the target area.
5. The student will be given twelve shots but only the best ten will be scored.
6. The assistant will note the points scored and call them out for the student and the recorder to hear.

C. Scoring:

1. The shots will be scored according to where the "tip" of the shuttlecock lands.
2. Shuttlecocks landing on a line between zones are to be given the higher of the two point values.
3. Shuttlecocks failing to clear the "clearing net," hit out of bounds (other than the twelve inch zone directly behind the back boundary line), "carried" or "slung," or otherwise faulted will receive no points.
4. Shuttlecocks touching the top of the "clearing net" and going over are scored as other shuttlecocks. Those hitting the net but failing to go over will receive no points.

D. Additional Personnel:

1. One student to record the scores as called out by the instructor or assistant.
2. Two students to watch the "clearing net" and call "short" for shuttlecocks which fail to pass over it. These students can retrieve shuttlecocks after each one is recorded.

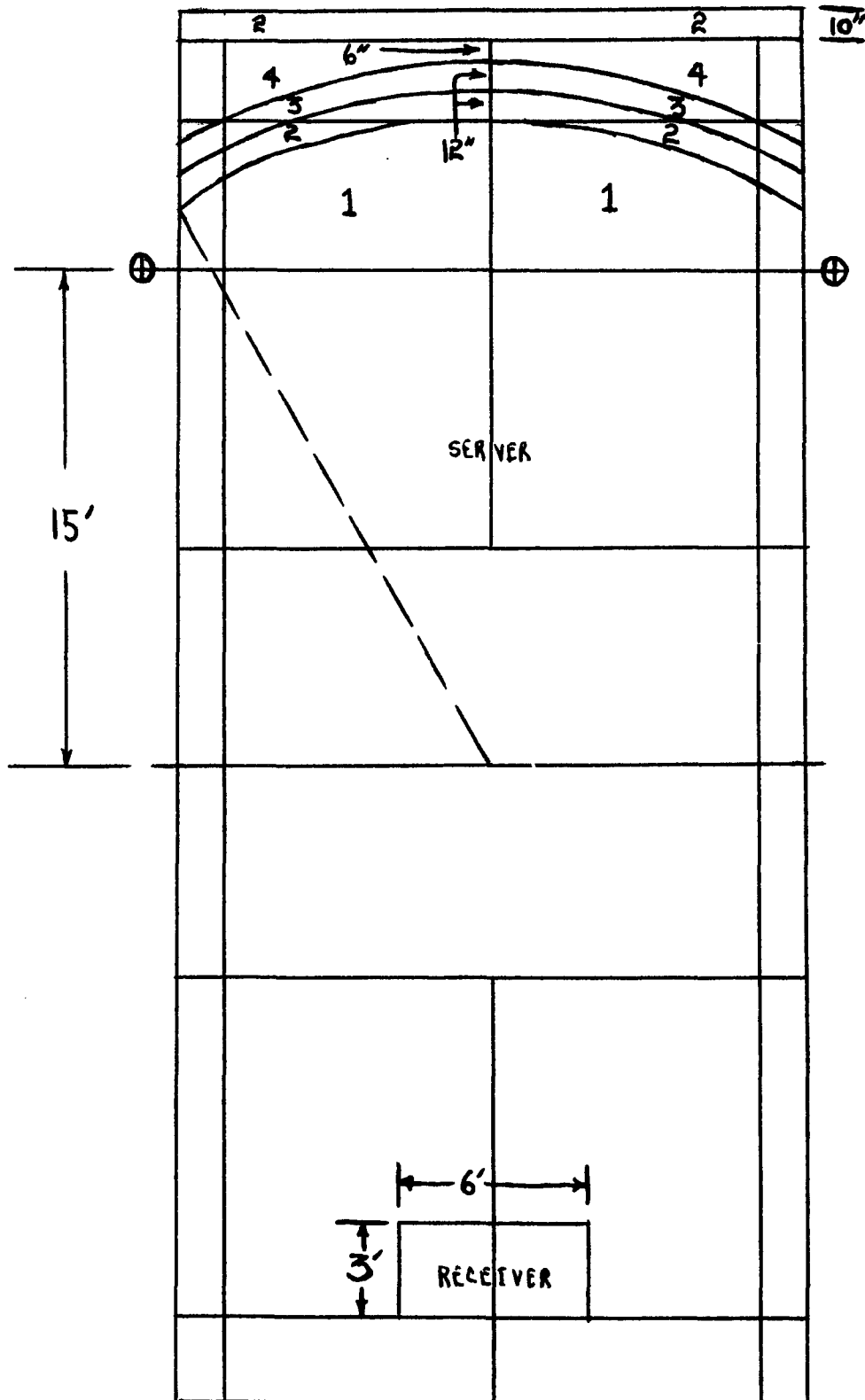
E. Instructions to read to the students:

You are to be tested on your ability to hit an overhead clear shot from deep in your court. You will have twelve shots but only the best ten will count toward your score.

You will stand in the marked box and a high serve will be hit to you. As soon as the shuttlecock is hit you may move wherever you wish. You will attempt to hit the shuttlecock with an overhead clear stroke so that it will go over the net on the other side of the court and fall within the zoned area. You will attempt to clear all shots hit to you. If, in the administrator's opinion, the served shuttlecock hit was a poor one, he/she will call "no" and hit another one to you. Shots hitting the ceiling will not be scored or count against your total number of shots. Shots will be scored as follows:

- | | |
|---|-------|
| 1. Zone farthest back | 2 pts |
| 2. Next closest zone | 4 pts |
| 3. Next closest zone | 3 pts |
| 4. Next closest zone | 2 pts |
| 5. Any shot clearing the "clearing net" but
failing to fall within one of the above
mentioned zones | 1 pt |

Layout for the Brumbach Clear Test:



APPENDIX E

ATHLETIC INSTITUTE LOOP FILMS, PROJECTOR, AND SCREEN

LOOP FILMS:

C- 1:	(3.42)	Grip and Cocking
C- 2:	(3.48)	Footwork
C- 3:	(3.42)	High Deep Serve
C- 4:	(3.42)	Low Short Serve
C- 5:	(3.40)	Drive Serve
C- 6:	(3.40)	Flick Serve
C- 7:	(3.46)	Forehand Overhead Shots: Defensive Clear, Attacking Clear
C- 8:	(3.46)	Forehand Overhead Shots: Smash, Drop
C- 9:	(3.46)	Backhand Overhead Shots: Defensive Clear, Attacking Clear
C-10:	(3.42)	Backhand Overhead Shots: Smash, Drop
C-11:	(3.42)	Drive Shots: Underhand Clear Shots
C-12:	(3.42)	Net Shots
C-13:	(3.42)	Around the Head Shots: Clear, Smash, Drop

PROJECTOR:

Technicolor Model 820Z
 Super 8 Instant Loop Film Projector
 Dial "On-Off" and "Frame": Zoom Focus: Stop-action

SCREEN:

Travelier Model 104
 14" H X 11" W X 11" D: 12 lbs.: 8" X 10" Screen

APPENDIX F
RAW DATA FOR GROUP I (VIDEOTAPE)

Ss	Pretest			Posttest			diff	diff ²
	SST	CT	Total	SST	CT	Total		
1	7	3	10	7	10	17	+ 7	49
2	0	20	20	23	23	46	+26	676
3	3	18	21	22	14	36	+15	225
4	0	0	0	0	0	0	0	0
5	0	1	1	11	4	15	+14	196
6	0	0	0	4	5	9	+ 9	81
7	4	0	4	7	5	12	+ 8	64
8	7	0	7	16	12	28	+21	441
9	14	22	36	16	34	50	+14	196
10	0	0	0	8	0	8	+ 8	64
11	1	3	4	2	3	5	+ 1	1
12	0	0	0	3	0	3	+ 3	9
13	14	3	17	15	21	36	+19	361
14	0	4	4	0	1	1	- 3	9
15	4	0	4	0	0	0	- 4	16
16	0	0	0	0	0	0	0	0
17	10	17	27	24	23	47	+20	400
18	4	10	14	10	22	32	+18	324
19	11	9	20	22	29	51	+31	961
20	0	12	12	11	18	29	+17	289
21	4	16	20	8	18	26	+ 6	36
22	0	0	0	0	0	0	0	0
23	0	0	0	1	0	1	+ 1	1

RAW DATA FOR GROUP II (LOOP FILM OBSERVATION)

Ss	Pretest			Posttest			diff	diff ²
	SST	CT	Total	SST	CT	Total		
1	0	0	0	4	0	4	+ 4	16
2	3	3	6	13	0	13	+ 7	49
3	4	0	4	8	0	8	+ 4	16
4	4	0	4	3	0	3	- 1	1
5	0	0	0	2	5	7	+ 7	49
6	5	13	18	22	22	44	+26	676
7	11	14	25	26	11	37	+12	144
8	2	0	2	0	0	0	- 2	4
9	0	0	0	0	0	0	0	0
10	0	2	2	0	2	2	0	0
11	0	0	0	0	0	0	0	0
12	0	3	3	0	15	15	+12	144
13	6	17	23	9	19	27	+ 4	16
14	4	1	5	6	18	24	+19	361
15	0	0	0	0	0	0	0	0
16	0	0	0	1	7	8	+ 8	64
17	4	15	19	9	19	28	+ 9	81
18	2	18	20	5	23	28	+ 8	64
19	0	0	0	0	0	0	0	0
20	0	4	4	0	0	0	- 4	16
21	0	0	0	7	1	8	+ 8	64

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